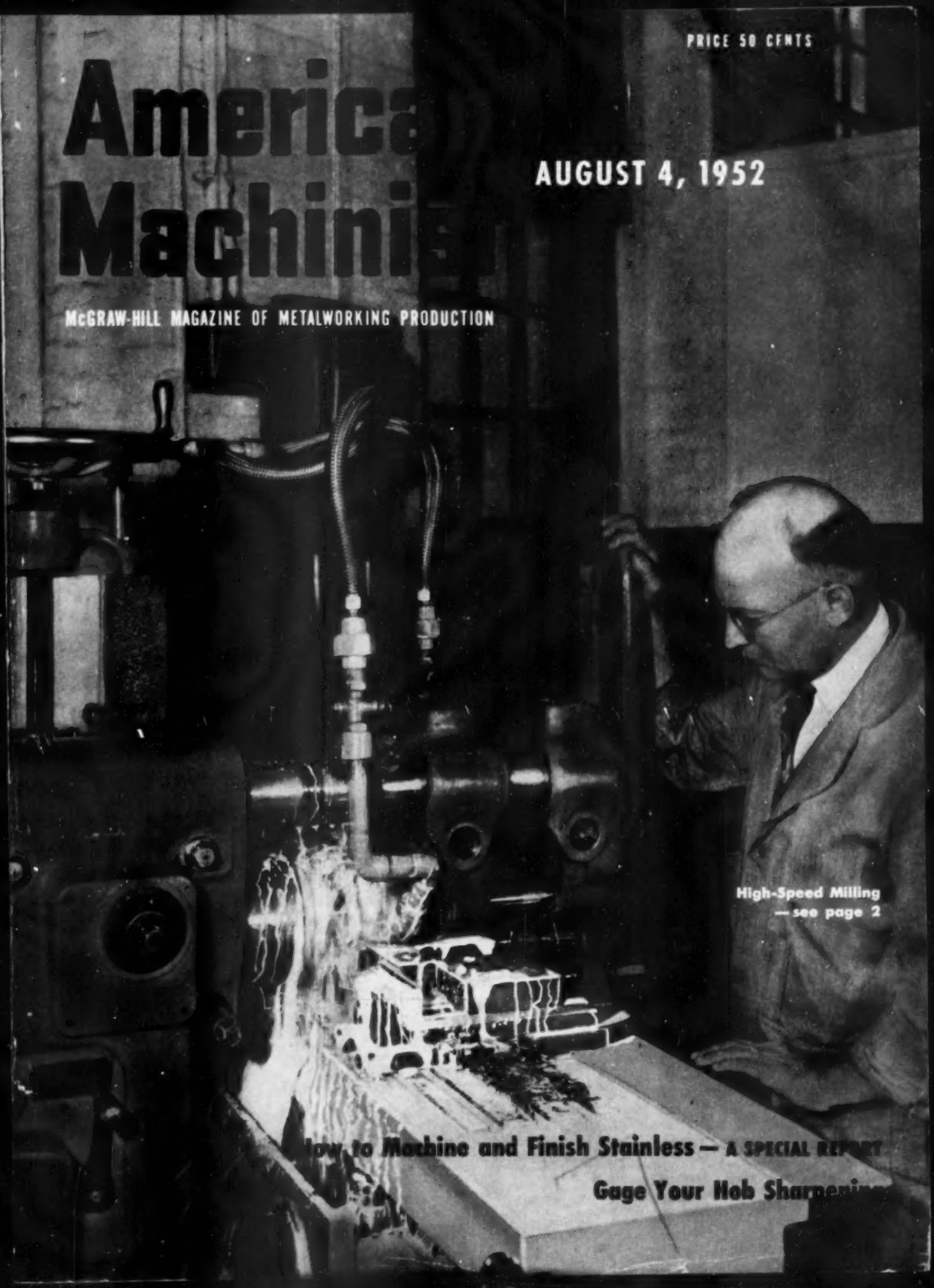
PRICE 50 CENTS

American Machinist

AUGUST 4, 1952

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

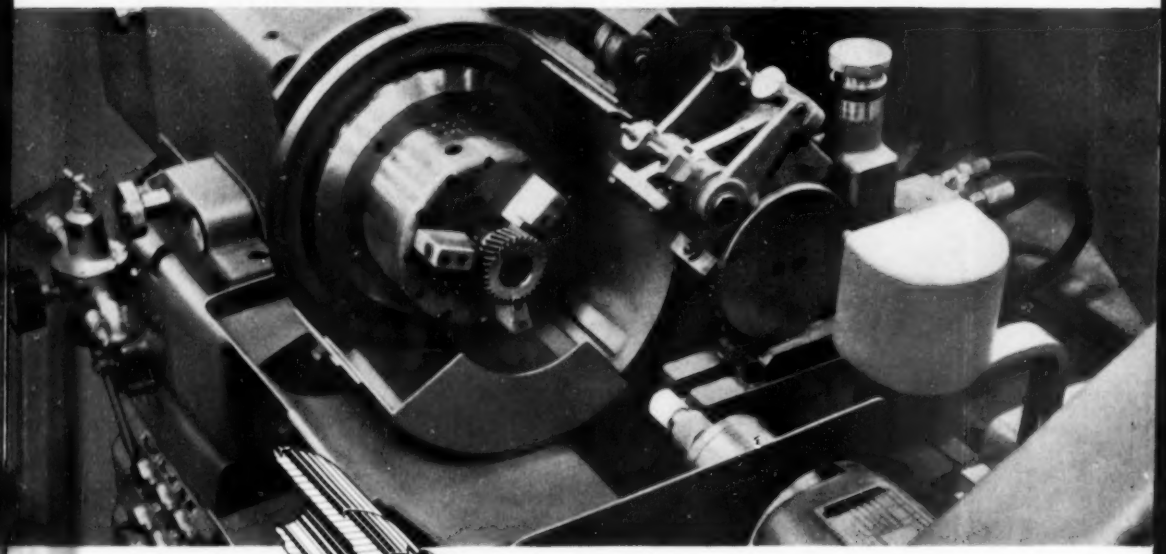


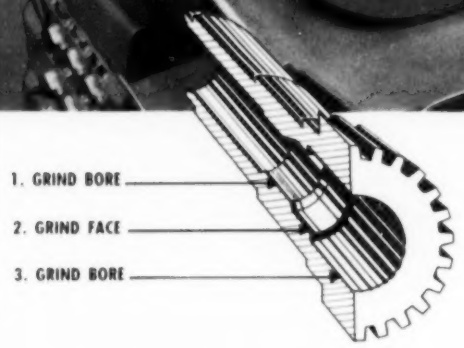
High-Speed Milling
—see page 2

How to Machine and Finish Stainless — A SPECIAL REPORT

Gage Your Hob Sharpening

Here's How Heald multiplied production by making one head do multiple duty





Double wheel spindle grinds 3 surfaces at the same time

● When one machine can be equipped to perform several different operations at once, there's a big saving in time and effort — and lower cost per part, too. The Heald Model 271 Size-Matic Internal Grinder above shows how this time-saving multiplicity of operations was applied to the finishing of transmission drive sleeves.

The two different size bores and a shoulder are ground simultaneously by a double-wheel spindle, in the following high-speed automatic cycle: The table is run in and positioned by a positive stop, with spindle and wheels in the proper location for grinding. The wheelhead then cross feeds into the work, plunge grinding the bores and bottom face. Cross slide then backs off, wheels are dressed, and table runs back in for short reciprocating finish stroke in the bore.

Remember — when it comes to precision finishing, it pays to come to Heald.

HEALD

Heald machines speed the nation's production

THE **HEALD** MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • New York

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

BURNHAM FINNEY ..... Editor
E. J. TANGERMAN ..... Executive Editor

•

RUPERT LE GRAND ..... Associate Editor
BEN BROSHEER (Chicago) .. Associate Editor
ANDERSON ASHBURN .... Associate Editor
H. E. LINSLEY ..... Associate Editor
MILES J. ROWAN ..... Associate Editor
GEORGE H. DEGROAT .... Associate Editor
CHARLES D. EMERSON .... Associate Editor
WM. M. STOCKER, JR. ..... Associate Editor

•

NORMAN FABER ..... Assistant Editor
ANN McTAGUE ..... Editorial Assistant

•

RICHARD ROOMAN ..... Art Director
ANNE PALMER ..... Assistant
HELEN LOWE ..... Makeup

•

LIONEL J. HOLMES ..... News Editor
STANLEY BRAMS ..... Detroit
WM. B. WHICHARD ..... Washington
ROBERT E. COCHRAN ..... Cleveland
MARGARET RALSTON .... San Francisco
JAMES LEE ..... Houston
E. DALTON WHITE ..... Atlanta
NATHANIEL McKITTERICK ..... London
ROSS HAZELTINE ..... Paris
CHRISTOPHER GEROULD .. Rio de Janeiro
GERALD W. SCHRODER ..... Frankfurt
ALPHEUS JESSUP ..... Tokyo
HERBERT LEOPOLD ..... Manila
JOHN WILHELM ..... Mexico City
JOSEPH GAMBATESE ..... Labor Editor
DOUGLAS GREENWALD .... Statistician

•

DEXTER KEEZER ... Director Economics Dept.
GEORGE B. BRYANT, Jr. ..... Washington
RUSSELL F. ANDERSON. Editor World News
FRED H. COLVIN ..... Editor Emeritus

ABC ABP

ALBERT HAUPTLI ..... Publisher
WILLIAM E. KENNEDY ..... Asst. Publisher
HUGH BRITTON ..... Service Manager

•

DISTRICT MANAGERS

R. Maultsby ..... Rhodes-Haverty Bldg., Atlanta 3
J. H. Koch .... 350 Park Square Bldg., Boston 16
W. J. Haring .... McGraw-Hill Bldg., Chicago 11
John Tiebout ..... McGraw-Hill Bldg., Chicago 11
Robert Anderson ... 1110 Delta Ave., Cincinnati 8
Robert Anderson ..... Hanna Bldg., Cleveland 15
R. H. Burke ..... Hanna Bldg., Cleveland 15
J. Cash ..... First Natl. Bank Bldg., Dallas 1
Philip Weatherby .... Penobscot Bldg., Detroit 26
H. L. Keeler .1111 Wilshire Blvd., Los Angeles 17
G. H. Krimsier .. McGraw-Hill Bldg., New York 36
G. Reppert, Jr. .. McGraw-Hill Bldg., New York 36
David Jones ..... Architects' Bldg., Philadelphia 3
R. H. Burke ..... 719 Oliver Bldg., Pittsburgh 22
John Tiebout ..... Continental Bldg., St. Louis 8
R. E. Dorland, Jr. .... 68 Post St., San Francisco 4

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

CONTENTS for AUGUST 4, 1952

VOL. 96, No. 16

ADMINISTRATION

Editorial ..... *Burnham Finney* 93
Aid or Trade? A Crisis Ahead 126A
Borrow—or Steal? ..... *Round Table* 127

SPECIAL REPORT

How to Machine & Finish Stainless ..... *G J Stevens, V Bankoski, L Spencer* 111

ASSEMBLY

Picture Prints Speed Assembly 128

ENGINEERING

Knurling Ups Wear Resistance of Chrome Plate ..... *E F Discoe* 101
Pin Measurement for involute Gears IX, X .... *R E Rawlings (RBS)* 137
JIC Open-Back Inclinable Presses ..... *(RBS)* 141

INSPECTION

Optical Comparators Simplify Inspection of Turbine Buckets 104

MATERIAL CUTTING, FORMING

Shop Shots 102
6 'Shop Kinks' Boost Output At Douglas ..... *W A Nordhoff* 108
Strengthened Engine Lathe Does Tough Spinning Jobs 129

TOOLING

Toolroom Conversion Produces Semi-Turret Lathe 107
Boring-Bar Brace Allows Quick Adjustment ..... *Louis Meyer* 129
Centering Drill Jib Grips Parts Securely ..... *James G Decker* 129
Bar Stock Makes Inexpensive Machine Slides .... *Clifford T Bower* 130
Wood Stock Tubes Cut Shop Noise ..... *N Palmer* 130
Super Sine Bar Does Multiple Work ..... *R G Vare* 131
End-Mill Gage Checks Clearance Angles ..... *N Schwartz* 131
Double-Bending Die Set Forms Small Channels ..... *H Hahl* 131
Saddle-Feeding Lever Speeds Bench Lathe ..... *Ian J Peacock* 132
Remote Throttle Control Built Cheaply ..... *Irving Epstein* 132
Rubber Punch Cuts Lead Foil ..... *T H Hsu* 132
Double Equalizing Clamp Grips Twin Parts ..... *Edward Walker* 133
Making Special Cutters for Odd Milling Jobs ..... *L B Williams* 133
Three Dies Form 1-in. Rings ..... *T H Hsu* 133
Expanding Mandrel Worked Chuck ..... *M/Sgt James K Wood* 134
Vise Gage Locates Part for Clean-Up ..... *N Palmer* 134

TOOL & PLANT MAINTENANCE

Gage Your Hob Grinding and Save Tools ..... *Ben C Brosheer* 95
Plan for Industrial Truck Maintenance ..... *Martin A Lyons* 98

NEWS OF METALWORKING

Spot News 79
Washington 81
Detroit 83
Machine Tools 85
Gaging Metalworking 89
Names in the News 150

DEPARTMENTS

Backlash 72
Reference Book Sheets 137
Talking Shop 143
Subcontracting News 152
Equipment, Materials, Parts .. 154
Round Table Discussion 180

American Machinist, published bi-weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder.

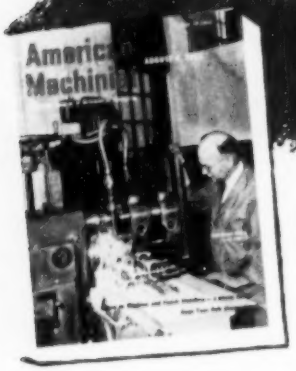
EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President, Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Nelson Bond, Vice President, Director of Advertising; J. E. Blackburn Jr., Vice President, Director of Circulation.

SUBSCRIPTIONS: Address correspondence to **American Machinist-Subscription Service**, 330 West 42nd Street, New York 36, N. Y. Allow one month for change of address. Subscriptions are solicited only from production executives and engineers in the metalworking industries. **Position and company connection must be indicated on subscription orders.**

Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Pan-American countries, $15 for one year, $25 for two years, $30 for three years. All other countries $25 for one year, $40 for two years, $50 for three years. Entered as second-class matter, August 12, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A.

Copyright 1952 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved.

Clips and Quips



High-Speed Milling . . . Our cover Flexichrome shows a Brown & Sharpe No. 12, 7½-hp plain milling machine slab-milling at 275 fpm and 22½ ipm feed. The cut is 2½ in. wide and 0.110 in. deep, the parts being milled are SAE 1120 steel. Elevated speed is attained by providing a copious supply of coolant through two wide nozzles, one on each side of the 3-in.-dia, 8-tooth, 30° HSS spiral cutter. Two arbor yokes and the gate, securely clamped to the overarms, supply the rigidity necessary for good cutter life and satisfactory finish.

Traveler . . . You may have noticed, in the last several issues, some new and different material from the West Coast aircraft plants. Those articles are the results of Associate Editor Rowan's Spring trip up the coast. Two more are in this issue, one a spread of Shop Kinks by W Nordhoff, estimator of machining at Douglas Aircraft, Santa Monica, the other a page on knurling inside cylinders (to improve lubrication qualities of chrome plate) at McCulloch Motors . . . Mr Nordhoff shows six ingenious machining setups, including burring the ends of small spacers, and automatic indexing head, tapping, disk grinding, and beveling. All are inexpensive, readily applicable to standard machine tools.

Bucket Check . . . Optical comparators have been used for some time to check air-foil contours of the blade section of gas-turbine buckets and the relation of blade section to root. It's a tricky and exacting job. We've gotten Jones & Lamson to give us the story of how it's done, including eight photos.

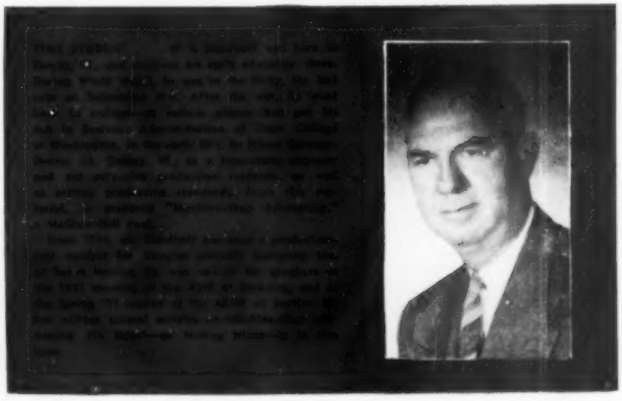
Pictures . . . There are three pages of pictures in the issue, including a spread of Shop Shots, and a page showing how Boeing replaces blueprints with pictures. These production illustrations are perspective views of the prototype assembly made by professional artists so they show details as actually seen from outside the plane fuselage or wing. Dressing of wires, tubes, connectors and like elements is clearly depicted.

Stainless Steel . . . Our current Special Report is really a 2-part job, covering both machining and finishing in its 16 pages. G J Stevens and V Bankoski of the Rustless Div, Armco Steel Corp, Middletown, Ohio, are the authors of the first 11 pages, intended primarily to give the "know-how" needed to eliminate headaches most commonly encountered in machining stainless. One section covers basic rules for tooling, machine operation, and cutting fluids; the second concentrates on specific operating tips for particular operations, including turning, drilling, tapping, threading, and forming extensively. Broaching, planing, sawing, milling, and boring are covered more briefly. . . . I. F Spencer, chief metallurgist at Landers, Frary & Clark, covers wheels, buffs, grits, and lubricants for finishing stainless, and the techniques.

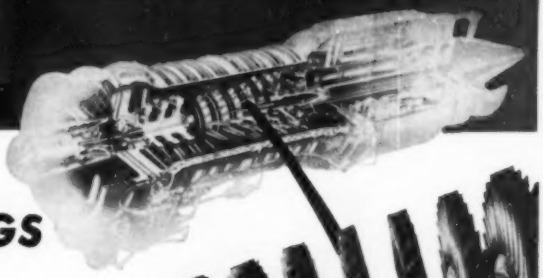
Hob Savers . . . Working independently, Chevrolet-Muncie (Ind) and J I Case have developed special gages that tell how much stock has been removed in grinding a hob. Ben Brosheer, associate editor in Chicago, describes how both gages are made and how they operate.

Truck Watch . . . Two and a half years ago, one of our associate editors spotted a story at Westinghouse on planned maintenance of industrial trucks. Martin A Lyons, supervisor of transportation at the East Pittsburgh plant, has finally gotten the data together, including a description of the system and the records by which Westinghouse not only plans and controls maintenance, but also guides trucks purchase and replacement according to performance data.

Coming . . . Aug 18 *AM* will have a cover and 8-page Special Report on how American Locomotive assembles the M-47 tank. There'll also be many short articles, covering air gaging, figuring coordinate settings, a special 2-position multi-drill table, a nibbling die, coolant systems for quench tanks, tricky tooling, some more aircraft "Shop Shots," automatic welding of eye bolts, and several other features.



AIRCRAFT GAS TURBINE ENGINES USE INTERCHANGEABLE



GLEASON
CURVIC® COUPLINGS

Note this compressor rotor for an aircraft gas turbine engine with its individual precision discs. Curvic couplings between each stage carry the torque load and accurately center the separate members.

Ground Curvic® and Zerol face couplings are produced automatically on the Gleason No. 19 Curvic® Coupling Grinder with a uniformity which makes each part interchangeable. Use of self-centering built up sections, perfectly aligned through fixed coupling teeth, simplifies manufacture and materially facilitates reassembly of large units to their original standard of precision.

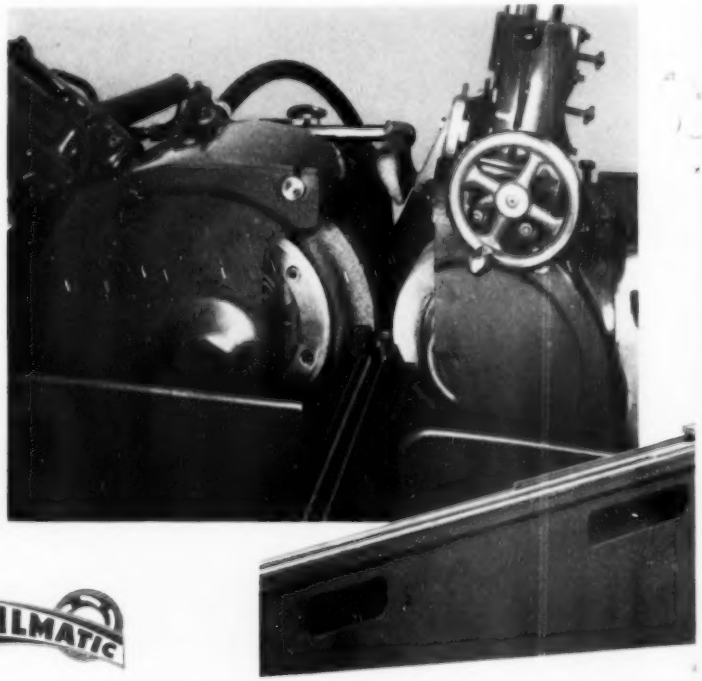
BUILDERS OF BEVEL GEAR MACHINERY · GLEASON · FOR OVER EIGHTY-FIVE YEARS

GLEASON WORKS

1000 UNIVERSITY AVENUE · ROCHESTER 3, NEW YORK

CINCINNATI
automatically

Here's a new method that will reduce costs for any shop producing long tapered parts. While the photographs illustrate the equipment for grinding glass casting rods by the thrufeed centerless method, the same idea may be employed for grinding many long, flexible tapered parts for civilian and defense needs. To perform this operation, a CINCINNATI FILMATIC No. 2 Centerless Grinder is equipped with a taper grinding attachment. The work is mechanically pushed between the wheels at a rate of about 185 in. per min. As feeding progresses, the regulating wheel unit, through a cam and hydraulic cylinder arrange-



Right. Two views of the equipment for grinding glass casting rods by the thrufeed centerless method. Traverse rate about 185 in. per min. Stock removal variable, 0 to 7/32". Machine: CINCINNATI FILMATIC No. 2 Centerless Grinder, equipped with Taper Grinding Attachment.

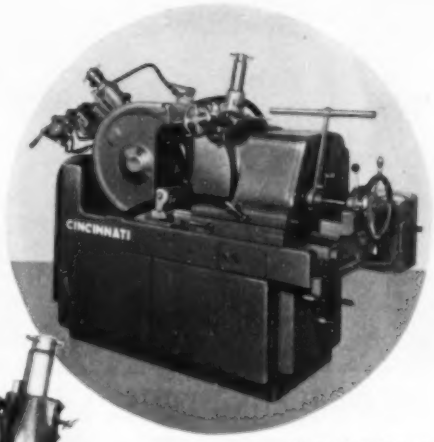
FILMATIC

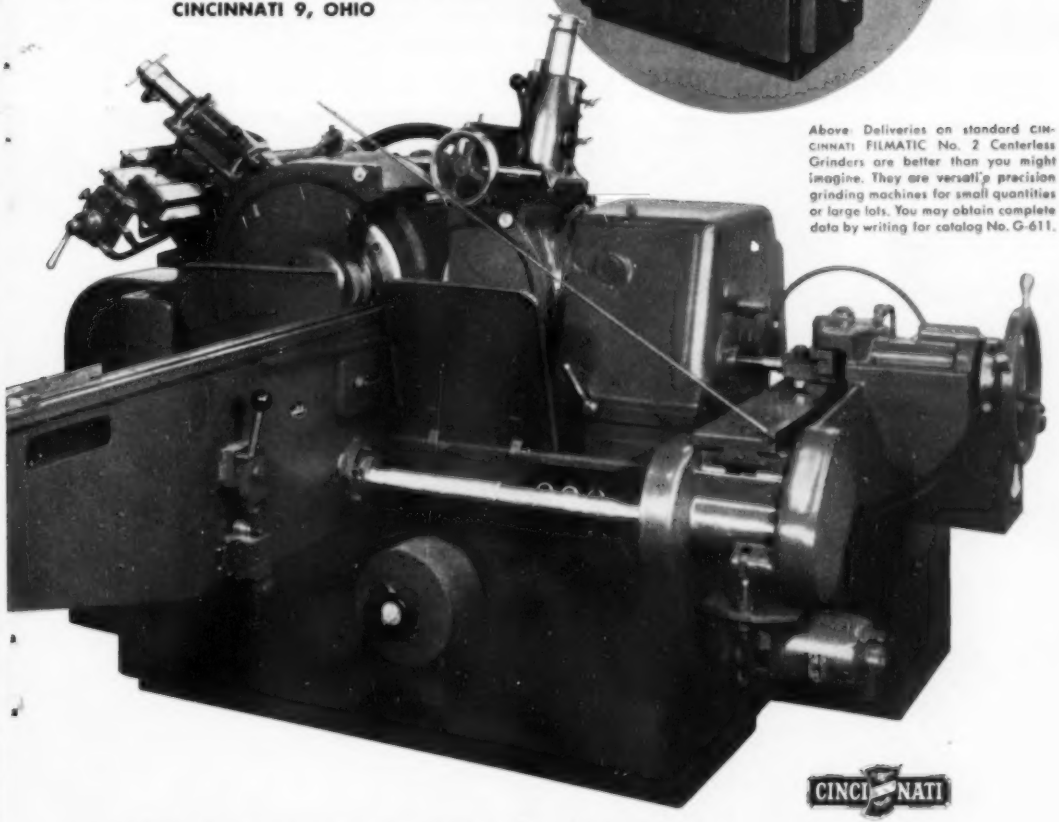
CINCINNATI

FILMATIC CENTERLESS
grinds taper on glass casting rods

ment, increases the distance between the wheels. Exceptionally accurate tapers are produced within ± .001" in 3" increments of length. By changing the cams and/or the change gear ratio, almost any desired taper can be thrufeed centerless ground. ¶ This ingenious centerless taper attachment, coupled with the advantages offered by CINCINNATI FILMATIC Centerless Grinders, give you a combination that can't be beat for low-cost accurate performance. FILMATIC grinding wheel spindle bearings run for years with no more than token attention; they require no adjustment. ¶ As always, our Application Engineers will be glad to help you with your precision grinding problems.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO



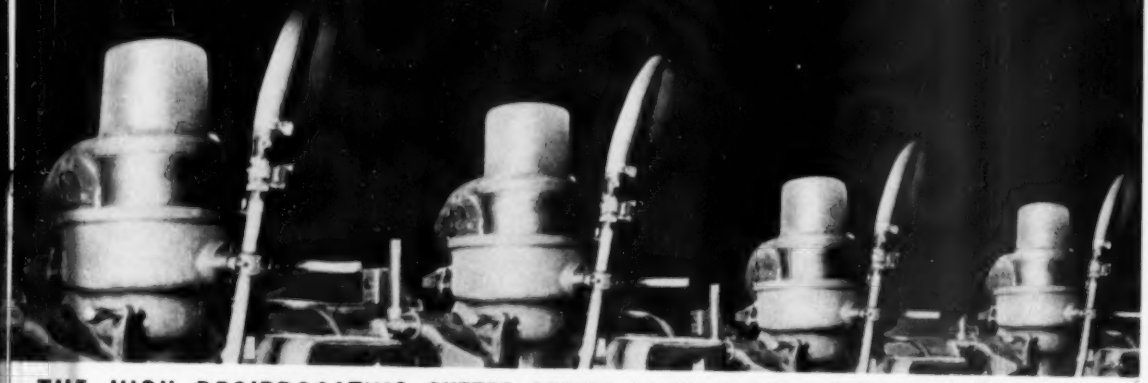


Above: Deliveries on standard CINCINNATI FILMATIC No. 2 Centerless Grinders are better than you might imagine. They are versatile precision grinding machines for small quantities or large lots. You may obtain complete data by writing for catalog No. G-611.

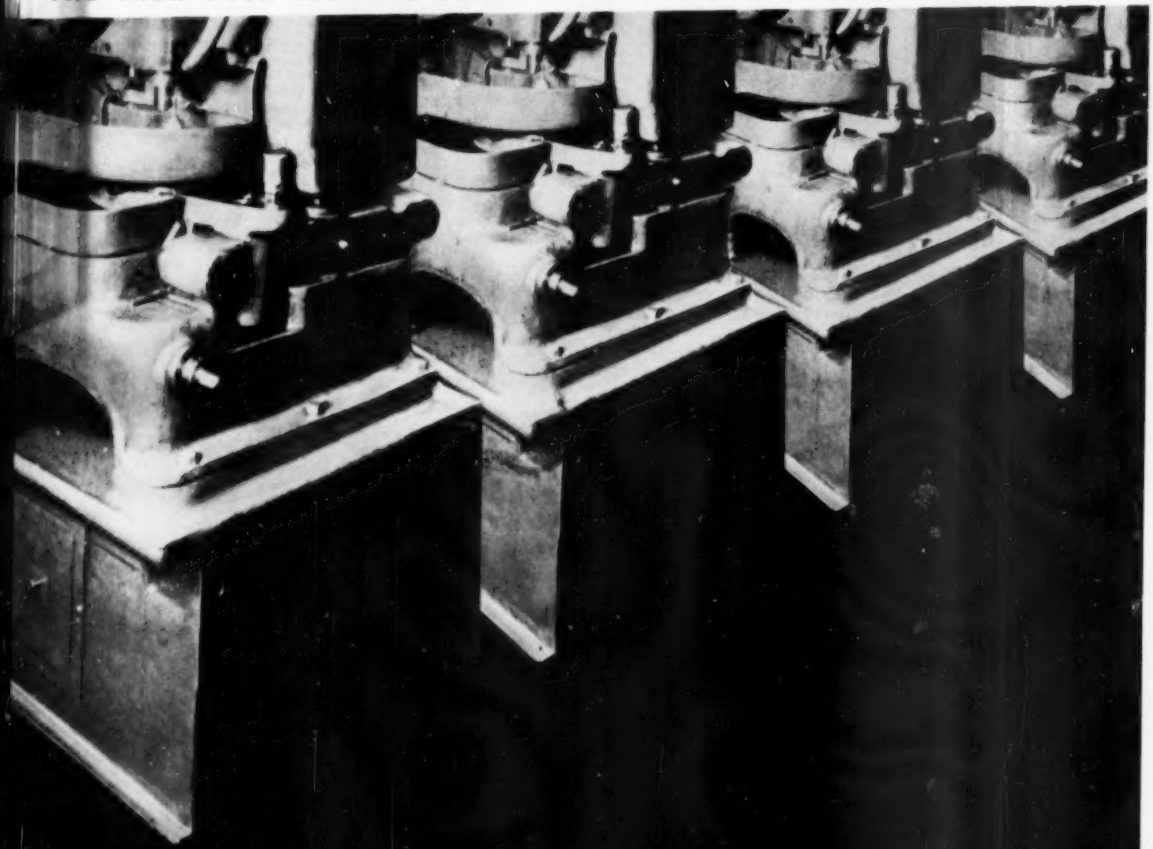
CINCINNATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

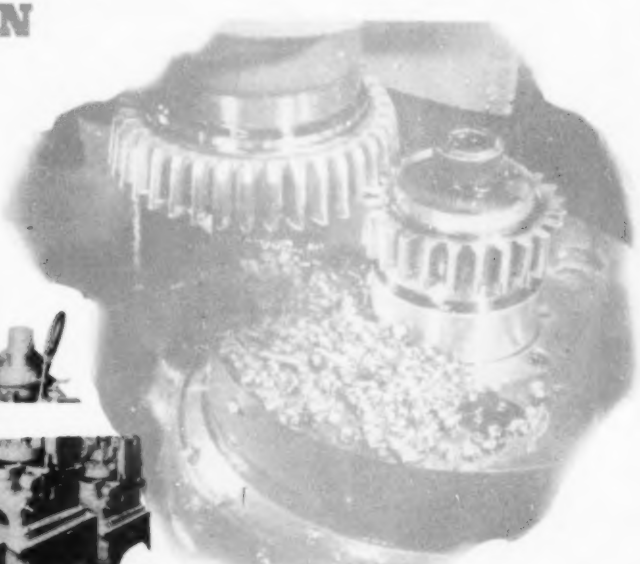
A first line tool for



THE HIGH RECIPROCATING CUTTER SPEEDS OF THE 7A-TYPE SHAPER MEAN MORE ACCURATE



HIGH SPEED, HEAVY DUTY, PRECISION Gear Production



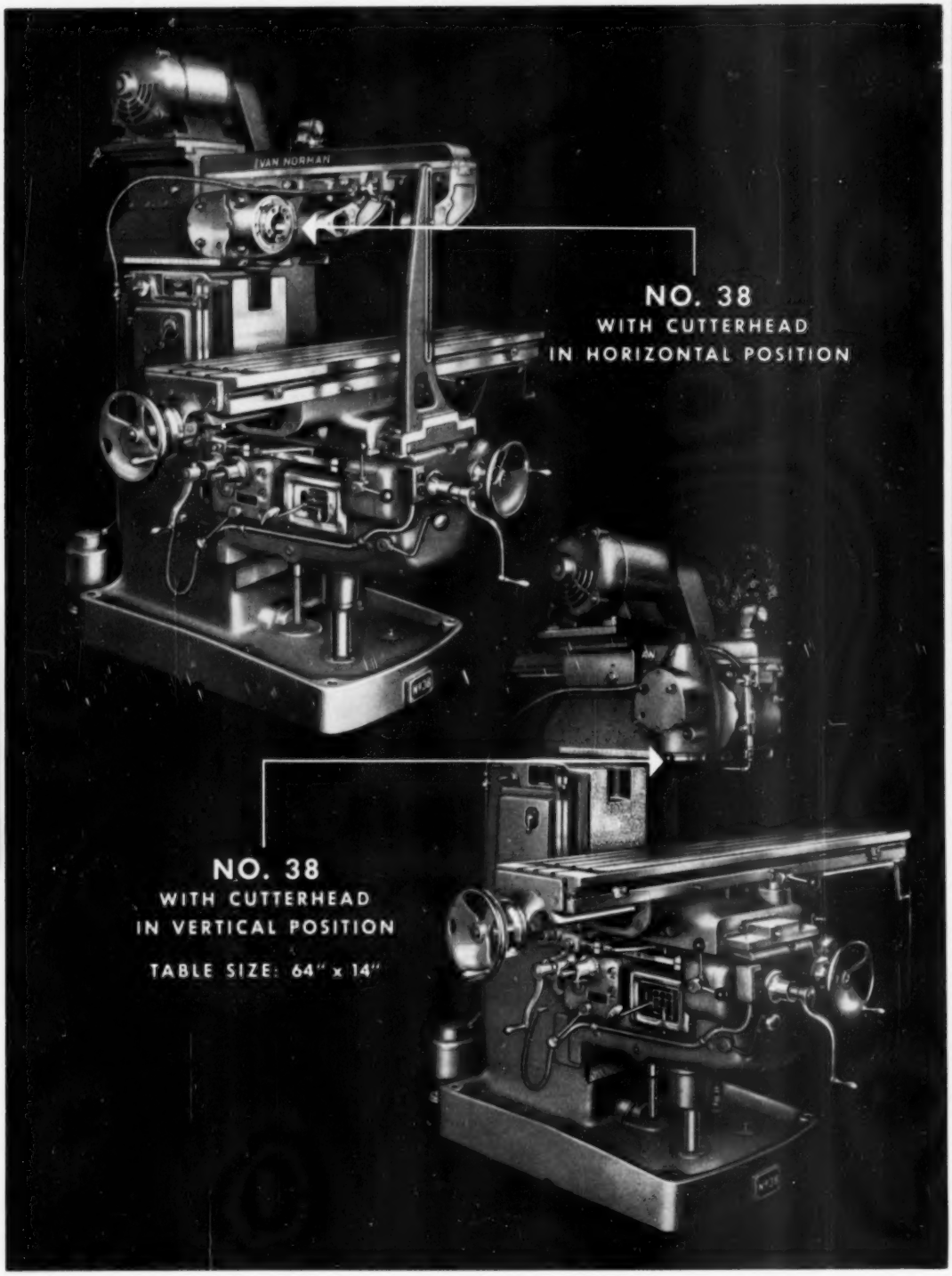
WORK ON A HIGH PRODUCTION BASIS

The 7A-Type High-Speed Gear Shaper offers accurate, high production of any size gear up to 7" pitch diameter and 2" face width at decreased cutter cost. The secret... short cutter travel, high cutting speed and fine cutter feed. Singly or in battery, the 7A economizes on man-attendance. Set-up is simple. Change-over on production runs from one part to another is quick.

... And never overlook the versatility by which coarse or fine-pitch gears, cams, ratchet teeth, interrupted profiles, segment gears, face gears, racks and special design parts all become grist for this Gear Shaper. Fellows Sales Engineers will be glad to discuss your general or specific problems. Write, wire or phone the Fellows office nearest to you.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 323 Fisher Bldg., Detroit 2 • 5835 West North Ave., Chicago 39 • 2206 Empire State Bldg., New York 1


IVAN NORMAN
NO. 38
WITH CUTTERHEAD
IN HORIZONTAL POSITION
NO. 38
WITH CUTTERHEAD
IN VERTICAL POSITION
TABLE SIZE: 64" x 14"

VAN NORMAN

Ram Type Millers Give You

MORE USEFUL WORKABILITY per Machine

The advantage of Van Norman Ram Type Millers is their versatility to meet the daily milling requirements by enabling operators to perform horizontal, angular or vertical milling, using conventional milling practice and standard arbors and cutters, all with one machine.

Not only does this important feature give you the workability of several single machines, but it also minimizes work set-ups . . . cuts idle machine and operator time by permitting you to meet job to job milling requirements as they occur.

In addition, the movable ram in combination with the saddle cross feed increases the work range and capacity of work that can be handled.

Because Van Norman Ram Type Millers enable you to meet all milling jobs, they keep operators and machines working. They cut costs, improve accuracy and increase production.

Write for information and catalog describing Van Norman Ram Type Millers.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

LANDIS WORLD'S **THREAD ENGINEERING DEVELOPMENTS FOR DEFENSE PRODUCTION** MACHINE LARGEST

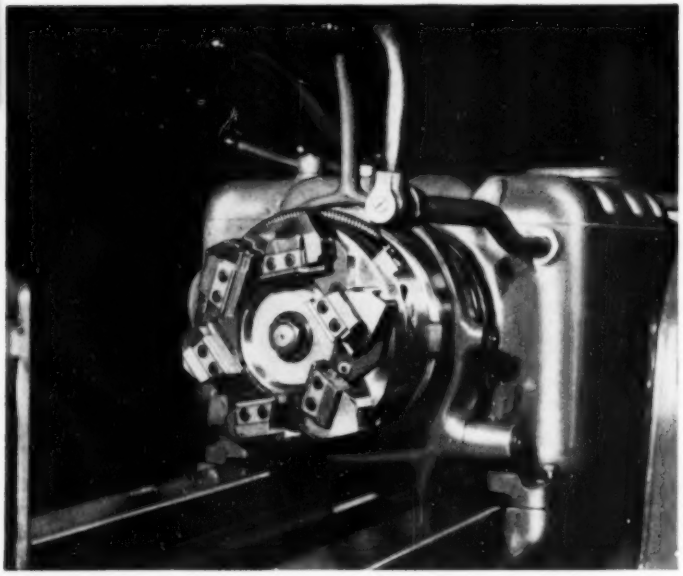
Landmaco Machine Adapted For Threading U. S. Navy Rockets

A LANDMACO Threading Machine, through special tooling devised by our Engineering Department, was recently adapted for use by a southwestern manufacturer for the precision threading of 5" Mark 6 Navy Rockets.

JOB REQUIREMENTS:

Specifications required the generation of 4¾" diameter 12-pitch threads on the rocket head. As a result of the design of the rocket this threading operation had been a trouble spot in the manufacturing process.

Concentricity limits had to be held between thread and the section of the workpiece projecting in front of the thread. It had been difficult to maintain the exact tolerances required. One of the problems arose from the fact that the diameter of the forepart of the projection was larger than the root diameter of the thread. Detailed specifications and engineering drawings of the rocket head are not available for security reasons.



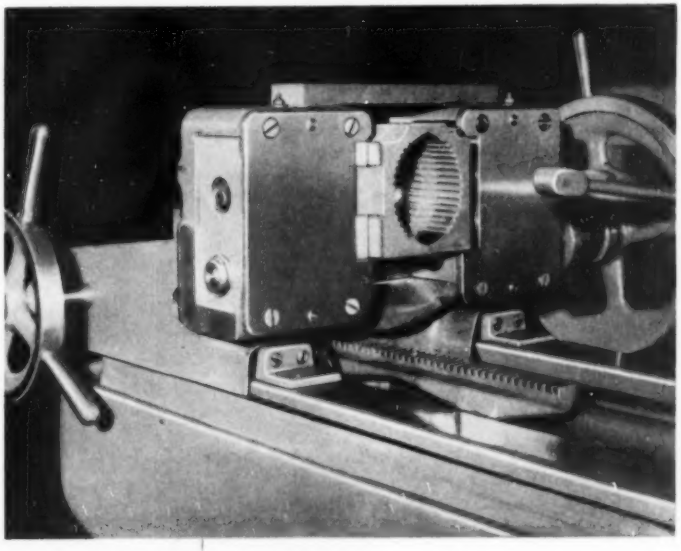
THREADING EQUIPMENT USED:

Today precision threads are being cut on these rocket heads at high production rates, and the threads are held to close concentricity. A battery of three 2½" Single Head LANDMACO

COMPANY · WAYNESBORO, PENNA., U. S. A.

MANUFACTURERS OF THREAD GENERATING EQUIPMENT

Leadscrew Threading Machines are used in the operations, each equipped with Special Tooling devised to meet the problems of this specific job.



SPECIAL TOOLING:

1. *40RX LANCO Head.* This head features the use of six chasers, thus distributing the cutting strains over a larger number of threading tools. This results in a finer thread finish and longer tool life.

2. *Receding-type centering pilot.* The bore of each head is fitted with this pilot to maintain close concentricity. The pilot is slightly tapered so that it fits over the front end of the rocket head. Thus, before the work is gripped in the vise, it is engaged by the centering pilot while the head is open. A relief between the start of the thread and the larger diameter of the projection provides the clearance necessary for the head to close.

3. *Heavy-duty Vise.* It is adjustable both vertically and horizontally. A metal tie is doweled and bolted to the top of the vise as reinforcement to assure maximum strength and rigidity. The vise has round, serrated grips, precision-ground to insure uniform gripping surfaces.

4. *Hammer-blow hand-wheel.* Reduces operator-fatigue to a minimum, precludes slippage of the workpiece and facilitates its removal.

5. *Hand-operated work-stop.* This assures maximum chucking efficiency and uniformity of thread length. The work stop also eliminates one cause of die breakage in that it accurately positions the work axially in the vise to prevent the chasers from striking against work shoulders.

This special adaptation of a standard LANDMACO Machine illustrates the utility of Landis Threading Equipment in the growing expansion of military production. Landis Engineers have helped many manufacturers, just as this one, with their problems in thread production by recommending the proper equipment, and process for the job, and by devising special tooling for the job's unusual requirements. Perhaps your current thread production problem may be solved as successfully as this.

LANDIS

THE LANDIS MACHINE COMPANY

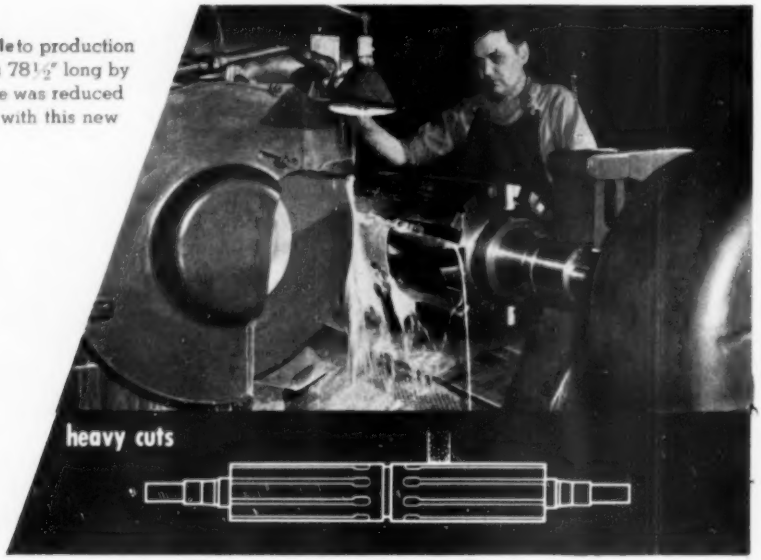
WAYNESBORO-6 • PENNSYLVANIA • U.S.A.

You Can Get Results Like These

from modern Landis

heavy cuts

Interrupted cut no obstacle to production of these slotted cylinders 78½" long by 13⅜" O.D. Grinding time was reduced from 7 hours to 6 hours with this new Landis grinder.

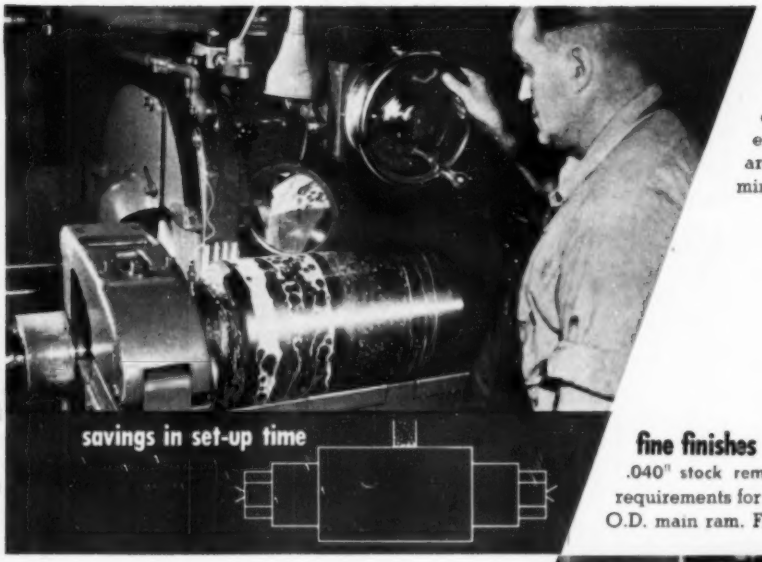


LANDIS 24" x 120" type FR Roll Grinder
Detailed specifications in Catalog F-48.
Send for your copy today

LANDIS

precision grinders

type FR Roll Grinders . . .



savings in set-up time

Regrinding roll for cold rolling operations. Patented crowning mechanism insures exact duplication of crowning setting on every job. Rolls have 20" face and are 12" O.D. Grinding time is 20 minutes floor-to-floor.

fine finishes

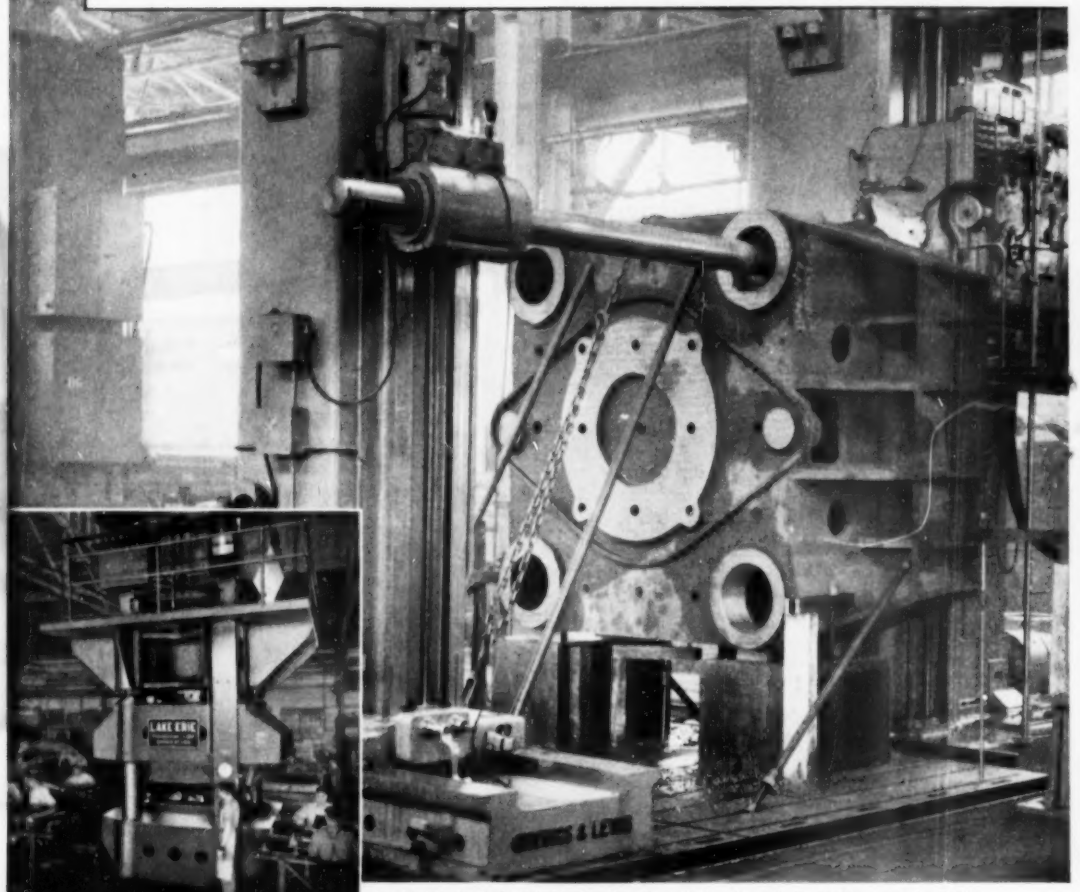
.040" stock removal to 6 micro inch finish are requirements for grinding this 32⅝" long by 13" O.D. main ram. Floor-to-floor time is 4 hours.

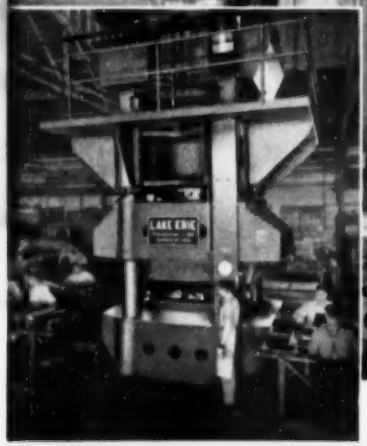
150

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U. S. A.

Save over 25% in set-up and

FOR 52,000 LB. CAST





This is the Lake Erie Engineering Corp. designed and built 2500-ton capacity Rubber Pad Aircraft Forming Press so vital to increased aircraft production. It is a four-column, downstroke, self-contained, hydraulic press with hydro-pneumatic cushion.

GIDDINGS & LEWIS

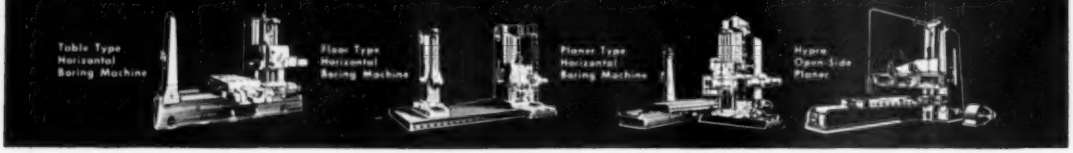


Table Type Horizontal Boring Machine
Floor Type Horizontal Boring Machine
Planer Type Horizontal Boring Machine
Hydro Open-Side Planer

machining time
STEEL PLATEN

To cut production costs on its diversified line of standard and special hydraulic forming presses for all industries, Lake Erie Engineering Corp. purchased a 570-FUAR G&L Horizontal Boring, Drilling, and Milling Machine.

It's currently being used to machine the 52,200-lb., cast steel moving platen. (Size of workpiece: 144" x 40" x 95½".). Only one setup is needed to line-bore four 15.500" column holes through the platen's top and bottom . . . to back counterbore for 19¾" dia. counterbores . . . to drill, bore, and face two 4⅛" dia pullback holes. All tolerances are easily held to ± .001". *Setup and machining time on this work is reduced by over 25%* since the G&L 570-FUAR went into operation. This figure is borne out by both time study and resulting incentive standards under which all production work at Lake Erie is performed.

This job is typical of how G&L Horizontal Boring, Drilling and Milling Machines can save your shop time and work handling... free equipment and operators for other jobs. G&L Horizontal's open-type construction means they can take large and small work, simple or complex. Extra-large working ranges mean there's a G&L multi-purpose machine to meet your particular needs. It will pay you to get complete details . . . and information about G&L's Job Analysis Service. There's no obligation. See our nearest representative or write direct. Don't hesitate . . . delivery might be better than you think.

G&L 5-POINT JOB ANALYSIS

takes the guesswork out of machine tool buying . . works for you and with you to solve big or complex machining problems..increases production . . reduces machining costs

1 **COMPLETE STUDY OF YOUR JOB OR JOBS** — G&L Job Analysis Engineers, working with your engineers, analyze your requirements by: (1) number and size of parts to be produced, (2) number and kind of operations needed, (3) tolerances and finishes required.

2 **DETERMINE MOST EFFICIENT MACHINING METHOD** — Taking into consideration the individual machining requirements of the job, G&L Job Analysis Engineers choose the most efficient machining method. G&L engineers can give an unbiased opinion because G&L builds a complete line of sizes and types of planers, planer-millers, vertical boring and turning mills and horizontal boring, drilling and milling machines . . . plus a complete line of accessories and tooling for these machines.

3 **SELECT THE SIZE, KIND AND TYPE OF MACHINE**—The machining method now determined, G&L Job Analysis Engineers — using your production and work requirements — recommend the exact size, kind and type of machine that will do the job most efficiently.

4 **PLAN YOUR OPERATIONS** — After the selection of the most efficient machine to fit your needs, G&L Job Analysis Engineers plan a sequence of operations that will (1) minimize number of setups and setup time, (2) use modern cutting tools to best advantage, (3) take full advantage of the machine working ranges and capacities, (4) keep operator fatigue to a minimum.

5 **RECOMMEND (AND DESIGN IF NECESSARY) THE TOOLS TO USE** — If conditions warrant, G&L will recommend the standard machine accessories, arrangements and tools you can use to make your equipment more productive—more versatile in application. If special equipment is needed, it will be designed to agreed specifications and made a part of your order.

Write, wire or phone G&L, or its nearest representative today. Get the facts on your needs — your problems. Get a G&L analyzed Job Analysis to help you. Don't hesitate — there's no obligation . . . AND DELIVERY MAY BE BETTER THAN YOU THINK!

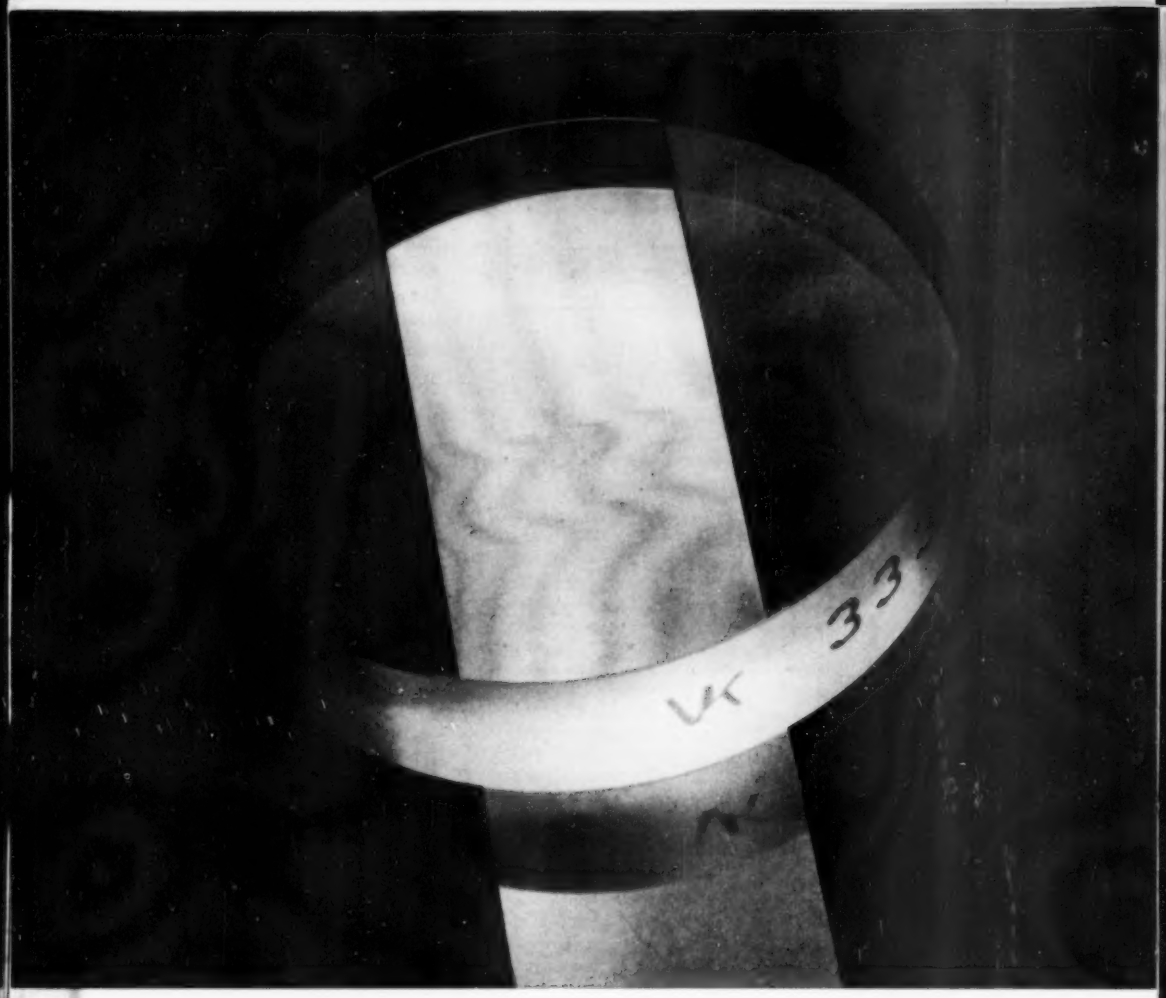
How to get a G&L job analysis

Call your nearest G&L dealer or write us direct. Furnish our Job Analysis Engineers with blueprints, job data, and production requirements. Factory engineers will completely analyze your machining problems. There's no charge, no obligation. Don't hesitate — do it today.

MACHINE TOOL CO.

G&L HYPRO

FOND DU LAC
WISCONSIN



Two grooves each .00001" deep on an amplifying gage anvil.

Do your amplifying gages tell the truth?

A SET OF VAN KEUREN OPTICAL FLATS

will tell the story instantly

The Van Keuren 1952 Catalog and Handbook No. 35 gives complete details on testing flatness with optical flats and solutions of many other measuring problems.

Write for your copy.

THE *Van Keuren* CO.,

33rd YEAR

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

Look for the distinguishing darkened rollers.
Thousands of tiny steel balls hammer the metal—"cold work" each roller . . . pay off in extra fatigue life . . . added ability to withstand shock and impact.

It's the SHOT-PEENED rollers that give your roller chain extra life!

. . . one of the extra-wear features you get with every LINK-BELT Roller Chain

POWER-TRANSMISSION engineers and metallurgists agree—shot-peened rollers mean longer roller chain life. That's just one of the engineering extras you get with Link-Belt Precision Steel Roller Chain. Another is Link-Belt's exclusive lock-type bushing.

Remember, too, Link-Belt's rigid material selection and controlled heat treating assure chain uniformity . . . no weak members.

Link-Belt builds a complete line of roller chain—single or multiple widths in 3/8" through 3" pitch; and double pitch, 1" through 3". Submit your chain problems to the Link-Belt office near you.

No partial bearing here —bushing fits securely

Lock-type bushings increase ability to withstand severe operating conditions

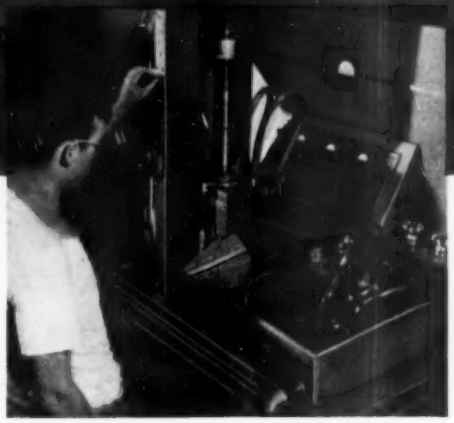
A special manufacturing process securely locks the inside sidebars on the bushing, preventing lateral movement of the sidebars and eliminating a common cause of stiff chains. This Link-Belt development is applied on roller chains through 1" pitch and double pitch roller chains through 2" pitch.

LINK-BELT

Precision Steel Roller Chain

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Sydney (Australia). Offices, Factory Branch Stores and Distributors in Principal Cities. 52.895

25 "Production Headaches" Avoided with RF HEATING!



These 25 tractor parts posed quite a problem to International Harvester's new Louisville Works. Each one had to be hardened—quickly, efficiently, economically. Each one could have been a "production headache"!

Management conferred, studied and carefully investigated the problem. This analysis, coupled with their past experience, led to the final decision. The choice for these parts . . . Induction Heating!

Westinghouse equipment was purchased with the following results:—reduced heating, machining, and steel costs . . . lower material handling costs . . . and better quality with lower product design costs. All this with only one 50 KW-450 KC and four 20 KW-450 KC Westinghouse RF units.

If you're the kind of alert businessman who is always on the lookout for increased production at decreased costs, look into the possibilities of Westinghouse Induction Heating.

The full Induction Heating story, complete with case histories, is told in a highly interesting booklet. Just send in the coupon for your free copy!

J-80242

Westinghouse Electric Corporation
Department M-42
2519 Wilkens Avenue · Baltimore 3, Maryland

Send me your informative case history booklet on induction heating.

Name ..... Position .....

Company .....

Street .....

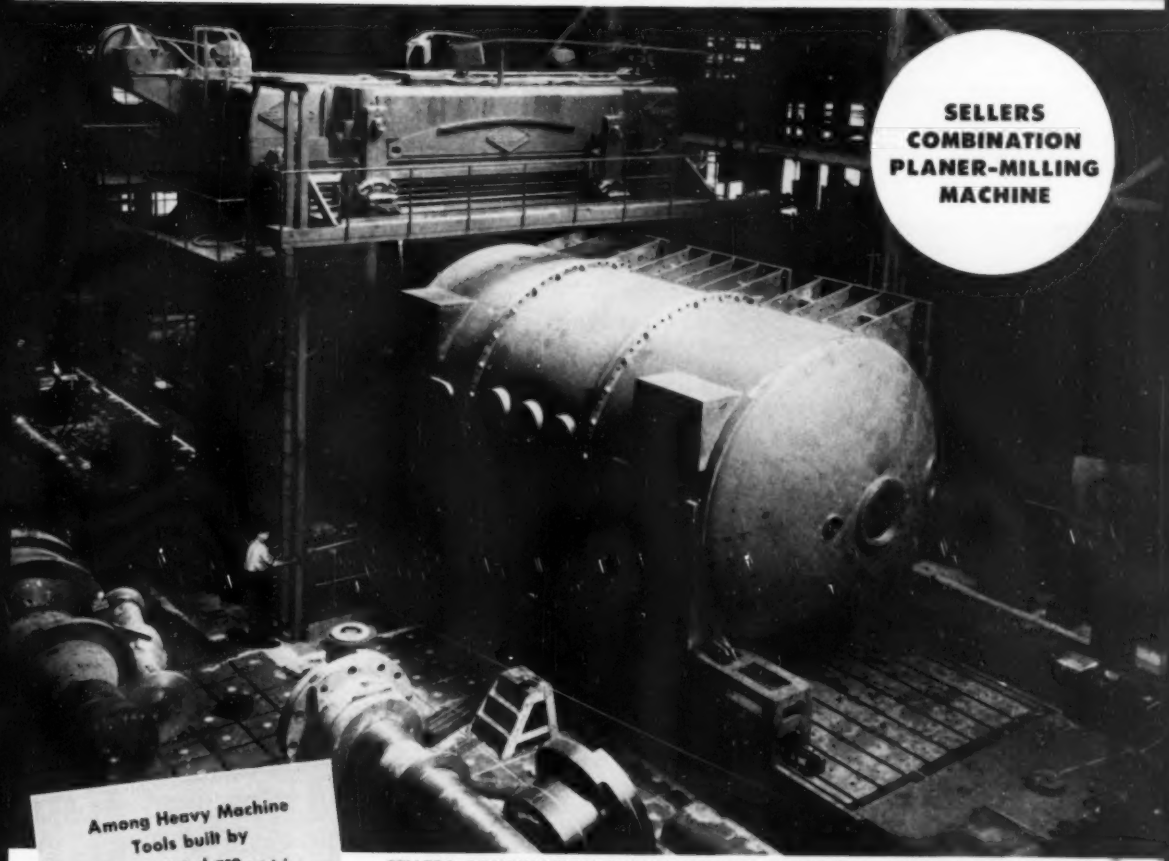
City ..... Zone ..... State .....

YOU CAN BE SURE... IF IT'S

Westinghouse

INDUCTION HEATING

ANOTHER GIANT CONSOLIDATED SPECIAL MACHINE FOR UNUSUALLY LARGE WORK



SELLERS COMBINATION PLANER-MILLING MACHINE PLANING A HUGH CASING

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

The Sellers Combination Planer-Milling Machine is used in the production of equipment for industrial and power generating applications such as, synchronous condensors, hydraulic turbine-driven generators and large motors and generators for steel mills and similar installations. Two machines in one . . . a planer and a miller . . . it eliminates the necessity of transfering work from one machine to another when both planing and milling operations are required. This huge machine is over 76 feet long, 27 feet high and weighs more than 645,000 pounds. It has the capacity to machine work 14 feet wide, 16 feet high and 30 feet long. Due to the enormous capacity of the machine, several parts to be machined may be bolted together and handled as a single unit.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

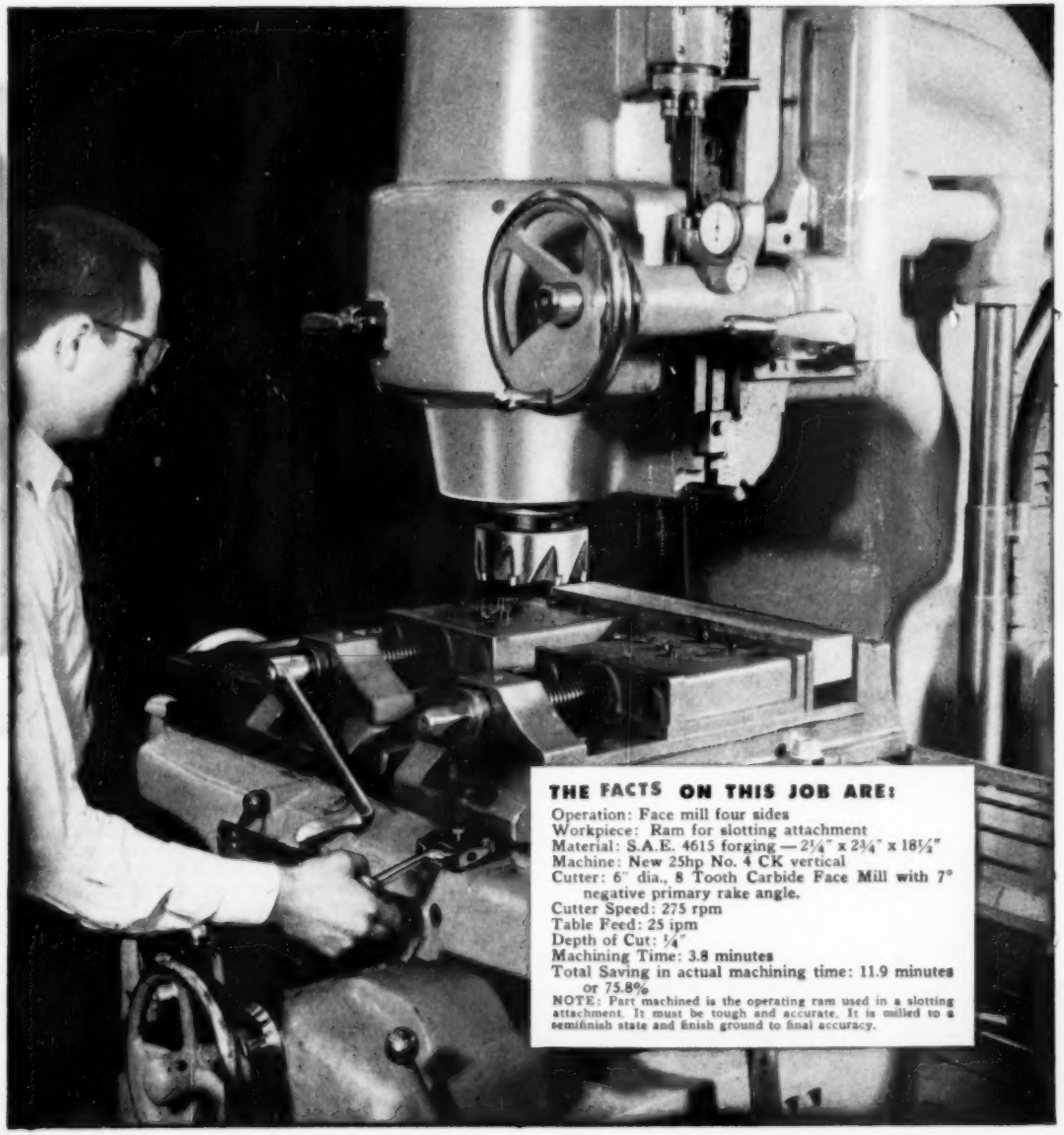
CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

facts tell the story NEW CUTS



THE FACTS ON THIS JOB ARE:

Operation: Face mill four sides
Workpiece: Ram for slotting attachment
Material: S.A.E. 4615 forging — 2¼" x 2¾" x 18½"
Machine: New 25hp No. 4 CK vertical
Cutter: 6" dia., 8 Tooth Carbide Face Mill with 7° negative primary rake angle.
Cutter Speed: 275 rpm
Table Feed: 25 ipm
Depth of Cut: ¼"
Machining Time: 3.8 minutes
Total Saving in actual machining time: 11.9 minutes or 75.8%

NOTE: Part machined is the operating ram used in a slotting attachment. It must be tough and accurate. It is milled to a semifinish state and finish ground to final accuracy.

KEARNEY & TRECKER MILWAUKEE

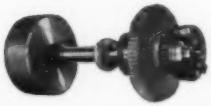
CK MILLING MACHINE PRODUCTION TIME 75%

4615 ALLOY STEEL FORGING MILLED IN 3.8 MINUTES . . . FORMER TIME 15.7 MINUTES

C-K MILLING MACHINE FEATURES THAT HELP DO THIS JOB BETTER

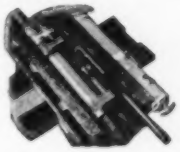
Greater rigidity of new CK column easily absorbed vibration from heavy cutting load. Only single pass needed for each part.

New CK machines have Greater Horsepower. On this job, 25hp permitted operator to get maximum production from his modern cutter.



CK's 3-bearing spindle and flywheel assured Maximum Cutter Efficiency. On this job, it meant fast metal removal and excellent finish in a single pass.

The new Kearney & Trecker CK milling machine on this job has 24 different spindle speeds (13 to 1300 rpm). Its 32 different table feeds range from ¾" to 90" per minute. Operator was able to pick proper *speed and feed* — to take full advantage of high horsepower and modern tools. The result — Greater Productivity on this job.



CK's new heavy duty (2" dia.) table feed screw gives greater bearing contact for smoother feed performance and sustained accuracy.

New 25hp No. 4 Model CK vertical

It will pay you to see the new CK line of milling machines — check them against your own requirements. You'll notice how every feature is designed and job-proven to give you cost-cutting results—greater machine capacity, productivity and better finished products. So, for the full story, contact your nearest Kearney & Trecker representative or write: Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

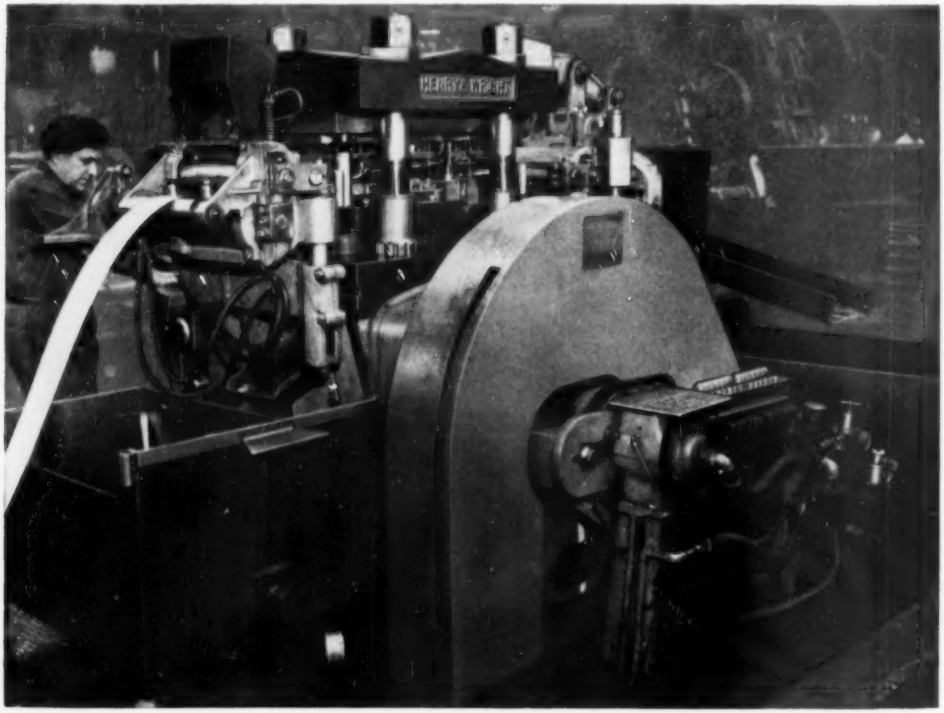
It Pays Three Ways To

First, you can combine operations — use progressive dies for metal stamping jobs that normally would require several presses. Second, you get high speed at no sacrifice in quality of work. Third, you get longer die life.

These benefits are inherent in the design of the Henry & Wright Dieing Machine. It is built to give them. Note low center of gravity — flywheel, crankshaft, connection are below the punchholder. This permits high speed, but minimizes vibration.

Maximum guiding surface is provided in the four-post punchholder guide, assuring constantly accurate alignment. A pulling stroke is applied to the die and the punchholder takes only the load required to do the work in the die. Any angular thrust from the crankshaft is absorbed by the lower crosshead.

For more pieces per minute and between grinds — for less handling and more finished work — modernize with Henry & Wright Dieing Machines. They are precision-built to do precise work.



In Chrysler's Highland Park Plant, Henry & Wright Dieing Machines are used to make fluid coupling fins and torque converter impeller blades. Note the low center of gravity of the Henry & Wright Dieing Machine. It allows high speed with minimum vibration.

OTHER EMHART PRODUCTS INCLUDE:

PREMIUM QUALITY STAMPING PRESSES
THE V & O PRESS CO.
Division of Emhart Mfg. Co.
HUDSON, NEW YORK

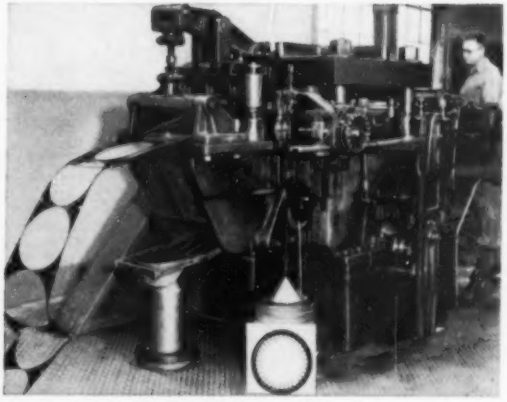
GLASS MAKING MACHINES
HARTFORD-EMPIRE CO.
Division of Emhart Mfg. Co.
HARTFORD 2, CONNECTICUT

AUTOMATIC PACKAGING EQUIPMENT
STANDARD-KNAPP
Division of Emhart Mfg. Co.
PORTLAND, CONNECTICUT

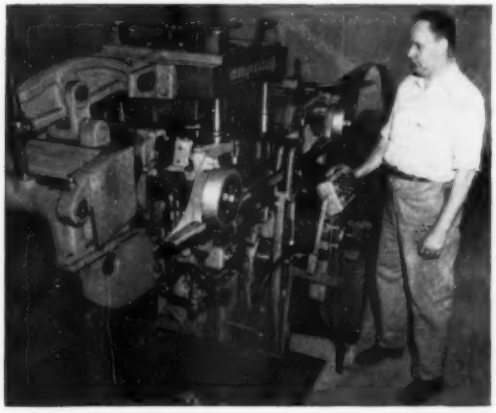
PLASTIC BOTTLES, RODS, TUBES, SPECIAL SHAPES
PLAX CORPORATION
Subsidiary of Emhart Mfg. Co.
HARTFORD 1, CONNECTICUT

Modernize Metal Stamping-
with Henry & Wright Dieing Machines

Knapp-Monarch Produces completed rotor and stator laminations for its electric motors on 25-ton and 50-ton Henry & Wright Dieing Machines. Both pieces are made at once, at speeds substantially in excess of equipment previously used.



Rotor and Stator Laminations are made simultaneously of silicon steel on 150-ton Henry & Wright Dieing Machines at Fairbanks, Morse & Co. Unique feature of H & W design is that the upper crosshead takes only the pressure required to do the work in the die.



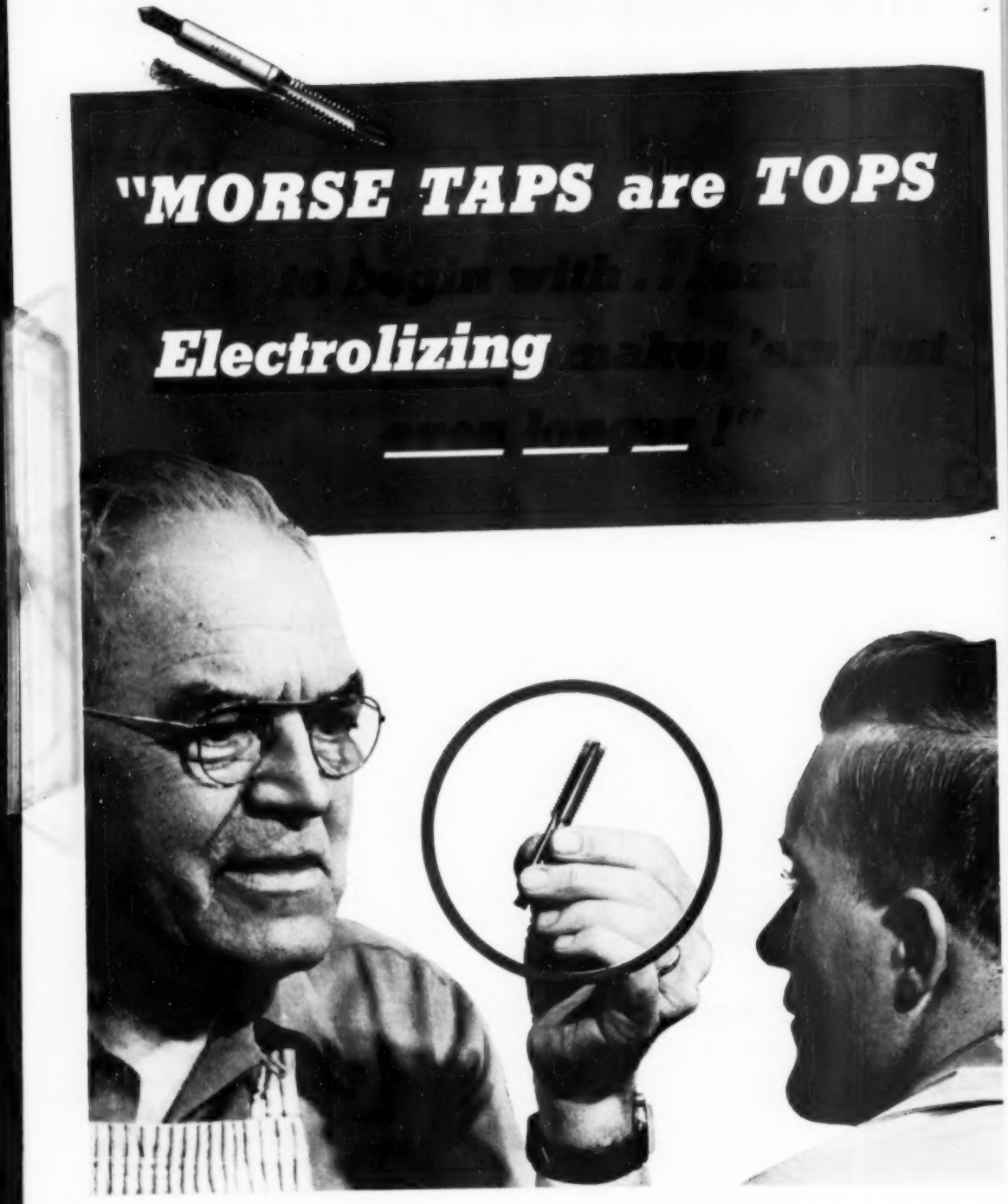
Numerous Types of motor laminations are made on the Henry & Wright Dieing Machines operating at General Industries. This illustration shows another unique advantage of these machines — the four post guide to the upper crosshead, which assures accurate and constant alignment.

Only the best is good enough

FACT PACKED CATALOG

Complete descriptions of all Henry & Wright Dieing Machines. Write: Henry & Wright, 481 Windsor St., Hartford 5, Conn.

HENRY & WRIGHT
Division of Emhart Mfg. Co.


"MORSE TAPS are TOPS
Electrolizing

From foreman to apprentice, for generations, the word on Morse Quality has been passed along unchanged: Morse has always made the taps that deliver top performance. For the regular job, you have Morse Straight-Fluted Taps. For stringy ferrous metals, you have Morse Spiral Pointed Taps that push the chips ahead and *out*. Then for non-ferrous metals, you have Morse Spiral-Fluted Taps that *draw out* the chips in a smooth flow. And they come in fractional or machine screw sizes, with one or more chamfers.

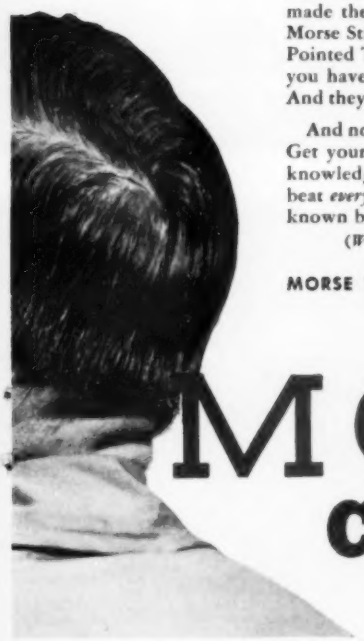
And now . . . if you want *even more* service-life, specify Morse *Electrolized* Taps. Get your Morse-Franchised Distributor to give you the benefit of his wide knowledge of tapping operations, *and his complete Morse stock*, to help you beat *every* tapping job in your plant . . . at a lower cost level than you've ever known before.

(Watch these pages for some tap news of headline interest . . . coming up soon!)

MORSE TWIST DRILL & MACHINE COMPANY, NEW BEDFORD, MASS.

(Division of VAN NORMAN CO.)

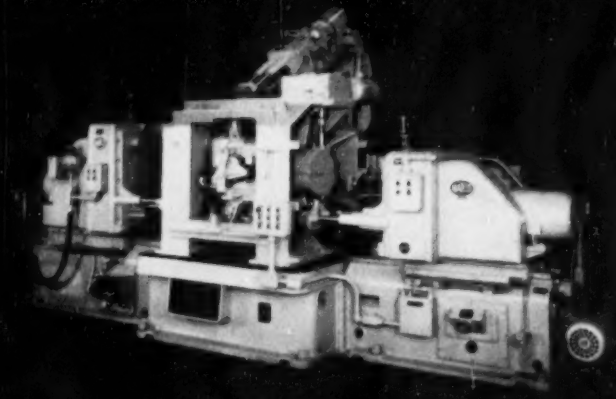
Warehouses in New York, Chicago, Detroit, Houston, San Francisco



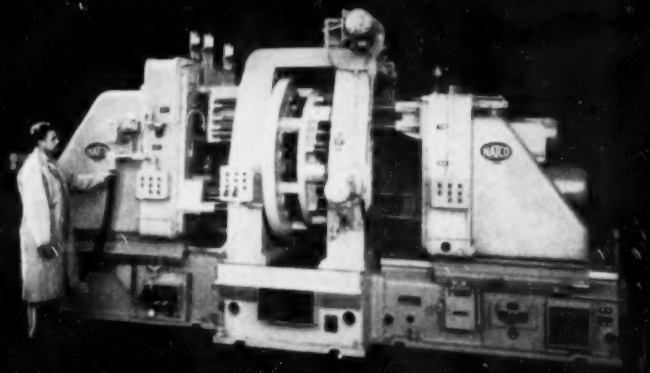
MORSE

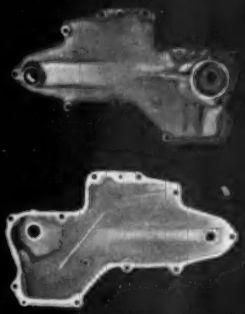
Cutting Tools

. . . buy them by phone from your Morse-Franchised Distributor and save ordering time

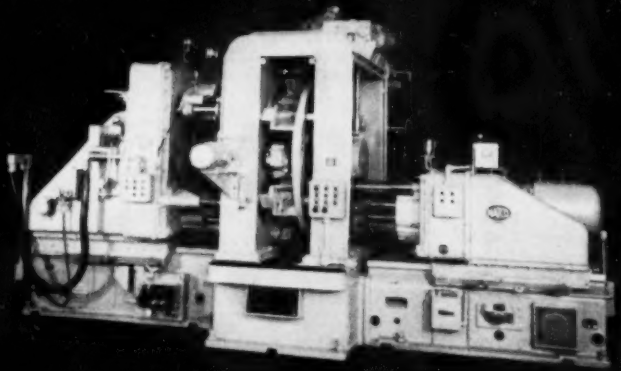


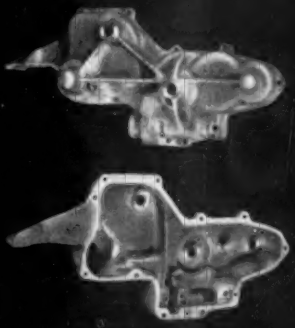
150 PARTS PER HOUR





150 PARTS PER HOUR





150 PARTS PER HOUR

Natco Engineered

FOR QUALITY AND QUANTITY PRODUCTION...

Yes, the three NATCO HOLESTEEL Way Type machines shown here were NATCO engineered and NATCO built to produce high quality automatic washer gear cases.

Operations include drill, chamfer, ream, mill, counterbore, spotface, core drill, plunge cut, hollow mill, face, groove and tap.

BY POPULAR DEMAND the new revised second edition of NATCO "Drills and Drilling Practice" handbook is now available. Send one dollar for this useful and valuable drill guide.

Call a Natco Field Engineer

To help you solve your problems in Drilling, Tapping, Boring & Facing.

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Indiana

Branch Offices | 1809 Engineering Bldg., Chicago • 409 New Center Bldg., Detroit
1807 Elmwood Ave., Buffalo • 2902 Commerce Bldg., New York City

Progressive

SCREW MACHINE DEPARTMENTS STANDARDIZE

with

HARDINGE

Collets - Feed Fingers - Pads

for

All Automatics, Turret Lathes,

Tool Room Lathes and Millers

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

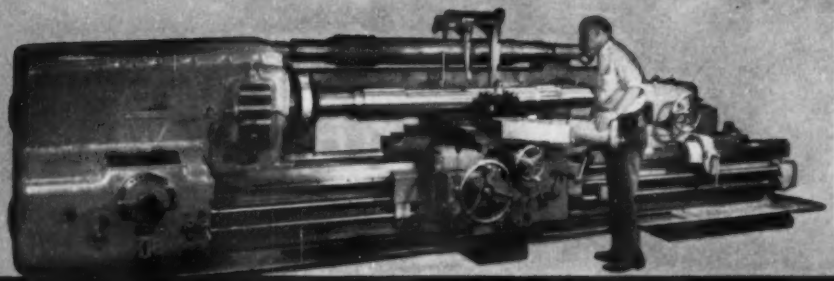
One hour

One hour to finish turn this Diesel Locomotive Driving Axle from the rough forging, removing 500 pounds of chips and using 60 horse power cuts in the process.

This shows what a 25" "AMERICAN" Hydraulic Duplicating Lathe driven by a 50 H.P. motor can do. Production records of this kind are the rule rather than the exception and are being made daily.

"AMERICAN" Hydraulic Duplicating Lathes reduce machining time 50 to 75 per cent . . . cut costs to the bone . . . pay good dividends on the investment.

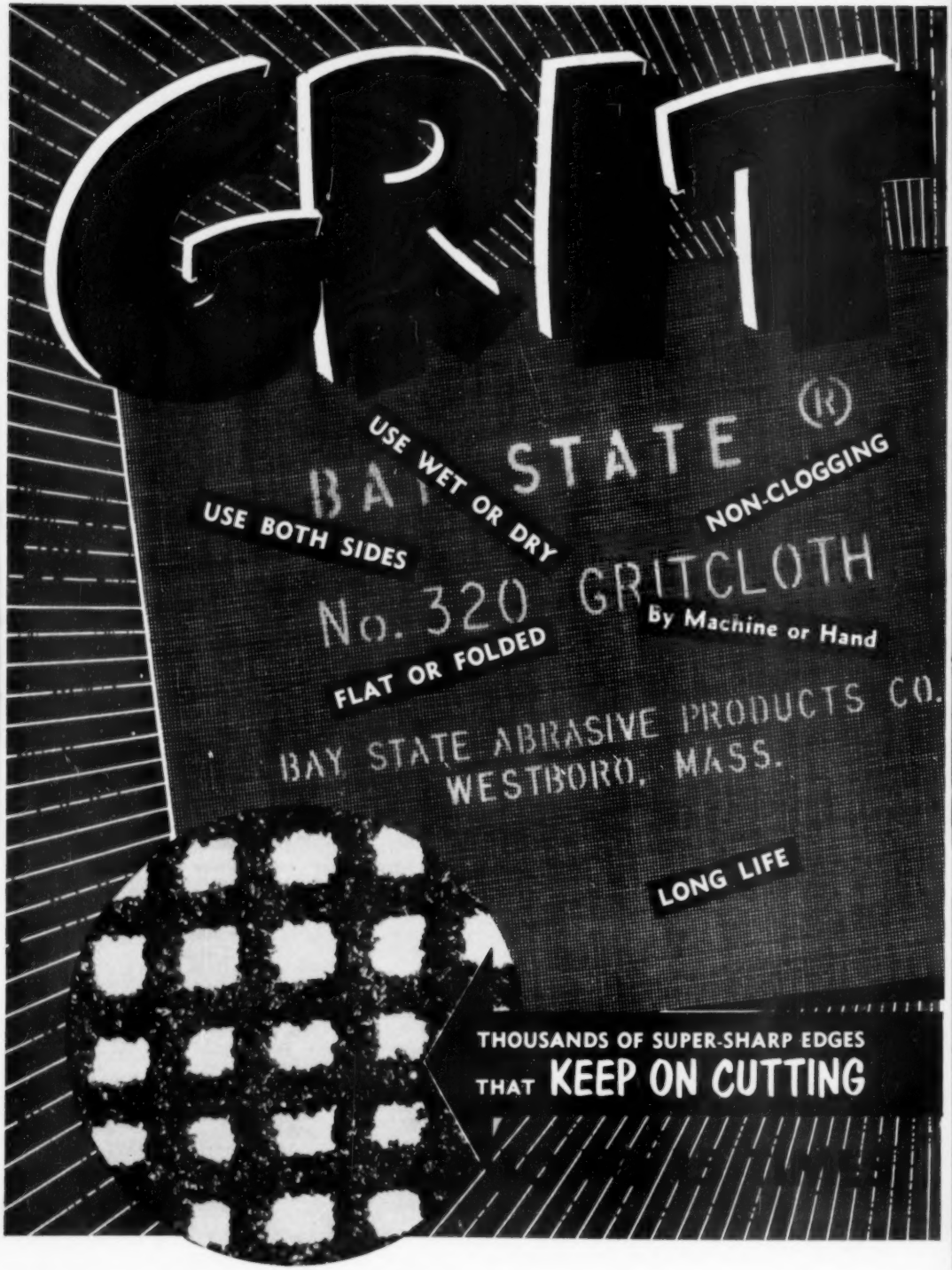
Repeat customers vouch for this in the most convincing way.



Bulletin No. 35 gives a complete description and shows many examples. It's yours for the asking.

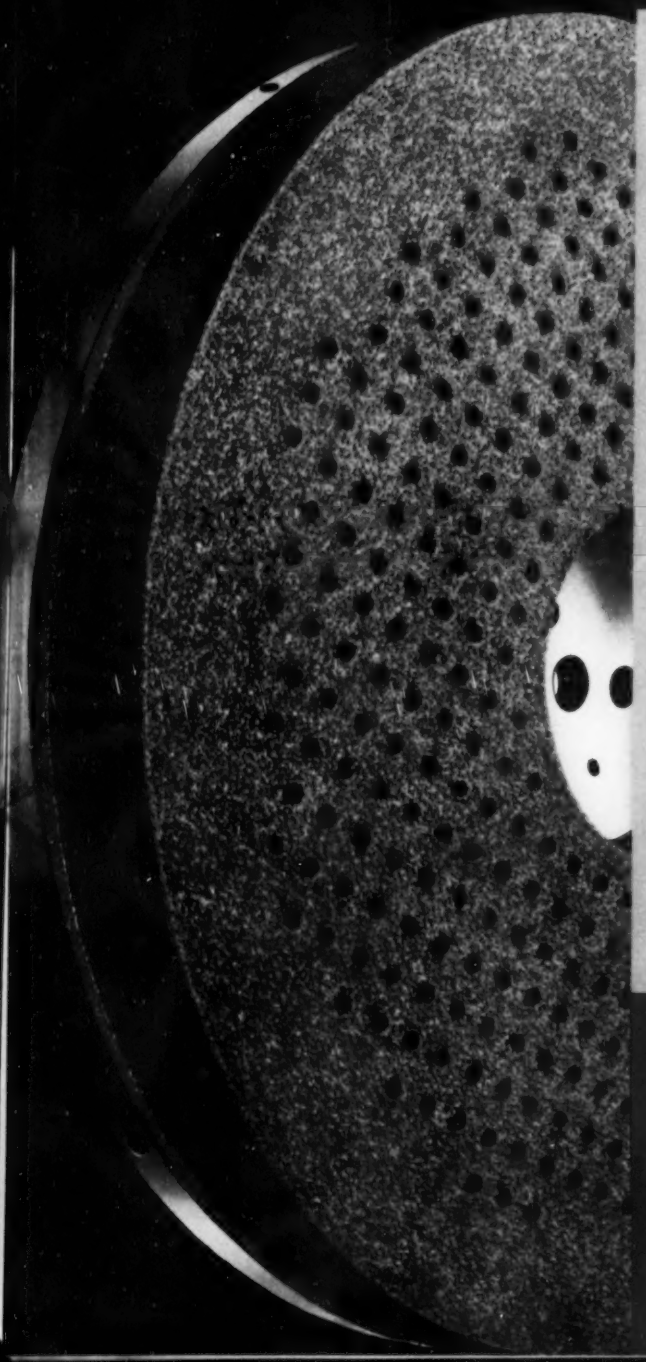
THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills


GRIT
BAY STATE (R)
USE WET OR DRY
NON-CLOGGING
USE BOTH SIDES
No. 320 GRITCLOTH
By Machine or Hand
FLAT OR FOLDED
BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.
LONG LIFE
THOUSANDS OF SUPER-SHARP EDGES
THAT KEEP ON CUTTING

CLOTH
Tomorrow's Sanding Fabric Today!
ANOTHER SPARKLING BAY STATE "FIRST"!
Once and for all, GRITCLOTH solves the age-old problem of clogging sandpaper and other types of coated papers. GRITCLOTH'S revolutionary open-mesh design lets the removed particles flow right through, and the sharp abrasive teeth keep right on cutting. Actual tests show 10 to 15 times the life of ordinary coated papers.
For all finishing jobs on either wood or metal, IT'S GRITCLOTH TODAY.
IT'S NEW IT'S BETTER IT'S BAY STATE
BAY STATE ABRASIVE PRODUCTS CO., WESTBORO, MASS., U. S. A.
Branch Offices and Warehouses — Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All principal cities
In Canada: Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.
SEND FOR SAMPLE!
BAY STATE

Fast Cutting Gardner Abrasive Disc Saves Valuable Contract



Today, it's the engineering service behind the abrasive disc that counts in cutting costs and increasing output. Gardner Abrasive engineers help you keep costs down by fitting the abrasive to the job. This case history shows how a large company benefited from Gardner service and abrasives.

For help in cutting costs and increasing output of your disc grinders, call the Gardner engineer nearest you. Write for a copy of the Gardner Abrasive Guidebook for better grinding results. It's free.

PROBLEM

To increase disc grinding production in order to meet delivery requirements of an important contract.

JOB DATA:

Grinder: 16" Double Spindle Disc Grinder
Work Piece: Metal Washer 2½" O.D. x ¼" Thick
Material: Steel Stamping, Hardened
Stock Removal: Up to .015" over-all
Tolerances: Within .001" for parallel

GARDNER RECOMMENDATION

(1) Add additional coolant tank to grinder
(2) Suggested using No. 80A60 grain Yellow-Rim Discs with DCS corrugations

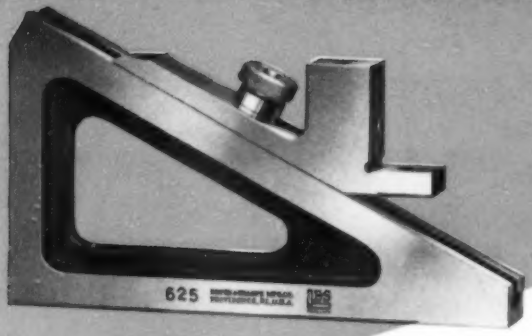
RESULT

Output increased 50% over former production due to heavier cuts made possible with this fast, cool-cutting Gardner disc.

GARDNER MACHINE COMPANY
410 Gardner Street, Beloit, Wisconsin

106A

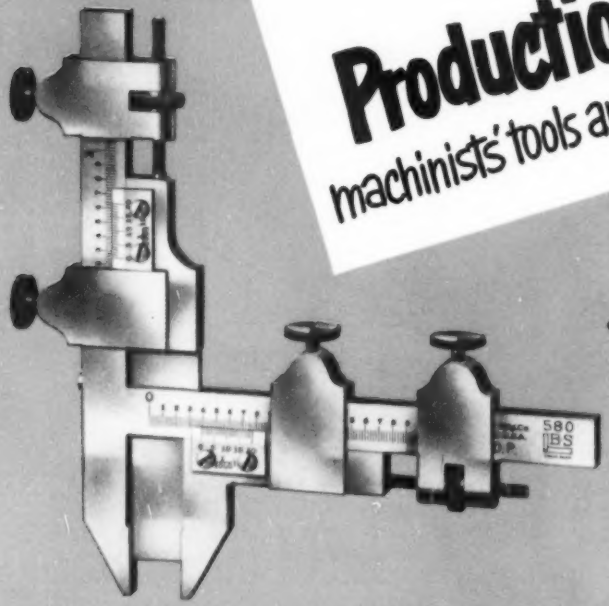
GARDNER
abrasive discs

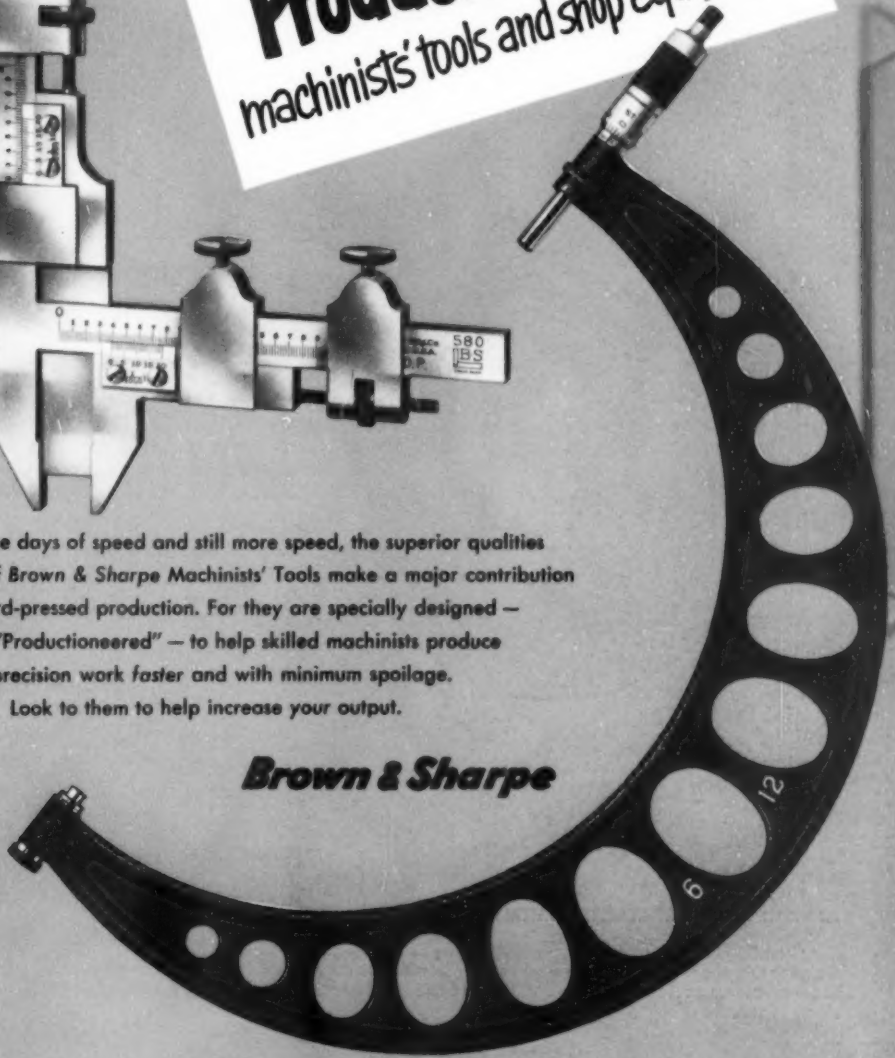


B·S

Productioneered

machinists' tools and shop equipment





In these days of speed and still more speed, the superior qualities of *Brown & Sharpe* Machinists' Tools make a major contribution to hard-pressed production. For they are specially designed — "Productioneered" — to help skilled machinists produce precision work *faster* and with minimum spoilage. Look to them to help increase *your* output.

Brown & Sharpe

Productioneered

for easier, quicker, accurate measurements

Brown & Sharpe MICROMETERS

One of the most used tools in the shop—the micrometer—has been improved by Brown & Sharpe to contribute more than ever to rapid, accurate production.

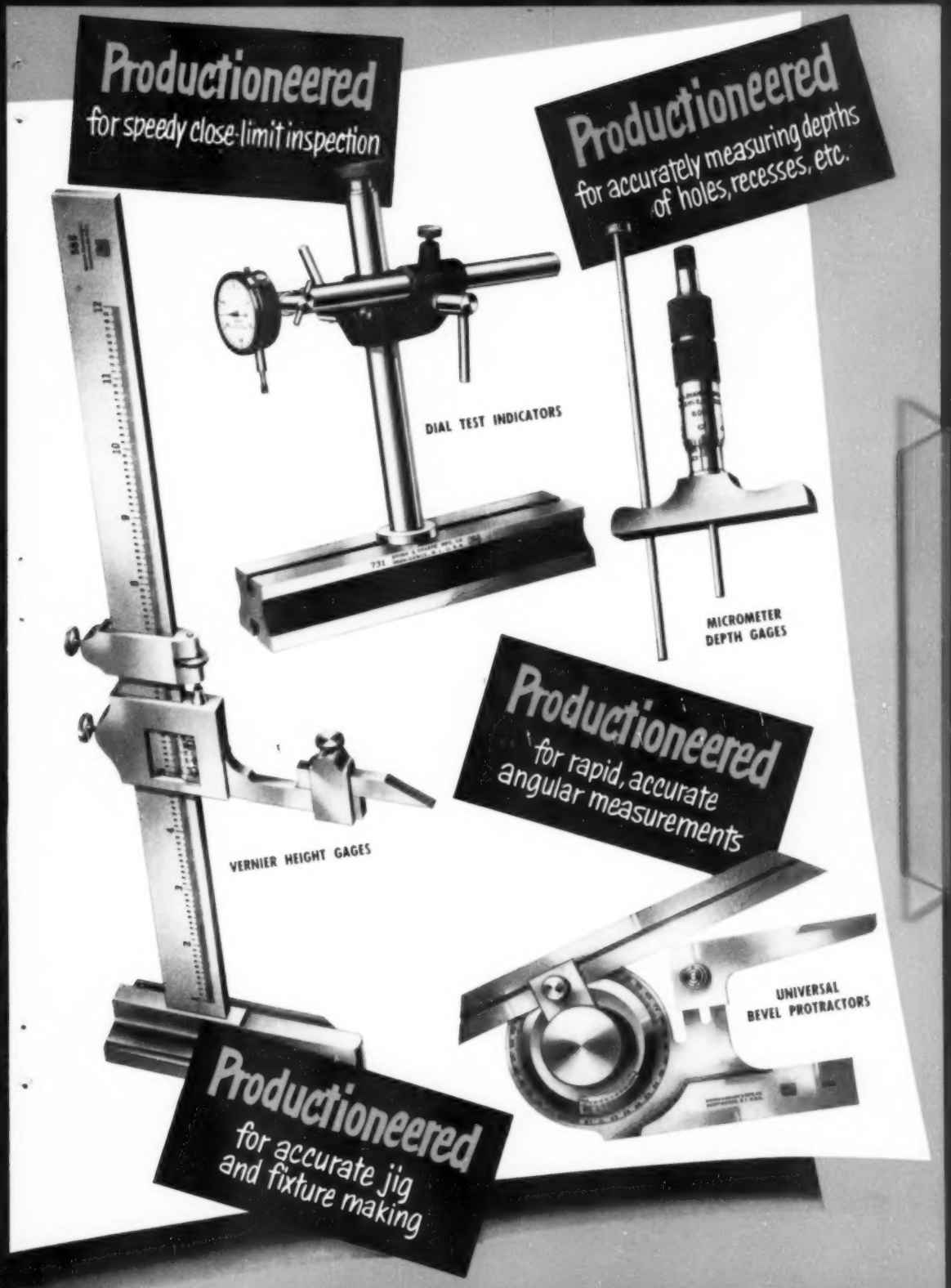
Easier to read—easier to keep in accurate adjustment—longer lived, with carbide measuring faces, stainless steel spindle and screw—it is a basic tool for accuracy. Brown & Sharpe offers a complete line of fine micrometers for every shop requirement.

AMONG THE IMPORTANT IMPROVED FEATURES . . .

Easy reading is provided by large-diameter thimble, with black graduations and figures on rust-resistant dull chrome finish.

Accuracy is assured through hardened measuring screw with precision ground threads.

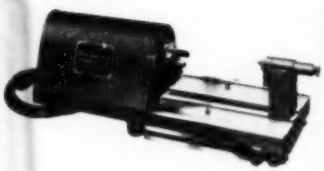
Long Wear is provided through such refinements as carbide measuring faces — wearproof for all practical purposes.


Productioneered
for speedy close-limit inspection
DIAL TEST INDICATORS
Productioneered
for accurately measuring depths of holes, recesses, etc.
MICROMETER DEPTH GAGES
VERNIER HEIGHT GAGES
Productioneered
for rapid, accurate angular measurements
UNIVERSAL BEVEL PROTRACTORS
Productioneered
for accurate jig and fixture making

Permanent Magnet Chucks — A simple turn of the lever holds the work to chuck. No jigs, fixtures or clamping tools — no electrical connections or heating.

Ground Flat Stock — Brown & Sharpe offers a choice of oil or water hardening types in 16 different thicknesses, from 1/64" to 1".

Vises — Provide strong, accurate work-holding for milling, drilling or grinding. Frequently eliminate need for expensive jigs and fixtures.



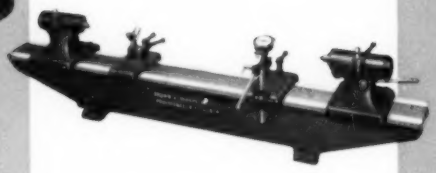
Cylindrical Grinding & Indexing Attachment — Used on surface grinders, it provides for dry grinding small cylindrical work, tapers, and work requiring indexing.

Productioneered

shop equipment that contributes to high output

Cast Iron Surface Plates — Provide trustworthy, true surfaces for reference purposes. Iron is uniformly hard — tools slide smoothly, easily on the surface. Wide range of sizes.

Spur Gear Testing Fixture — Provides for rapid and accurate testing of spur gears. Dial indicator shows run-out and variations in thousandths.



Bench Centers — Simple, accurate and fast, for holding cylindrical work for inspection.

Cast Iron Straight Edges — Testing surfaces of great accuracy, and exceptional strength and rigidity. In lengths up to 15 ft.

PRINTED IN U.S.A.

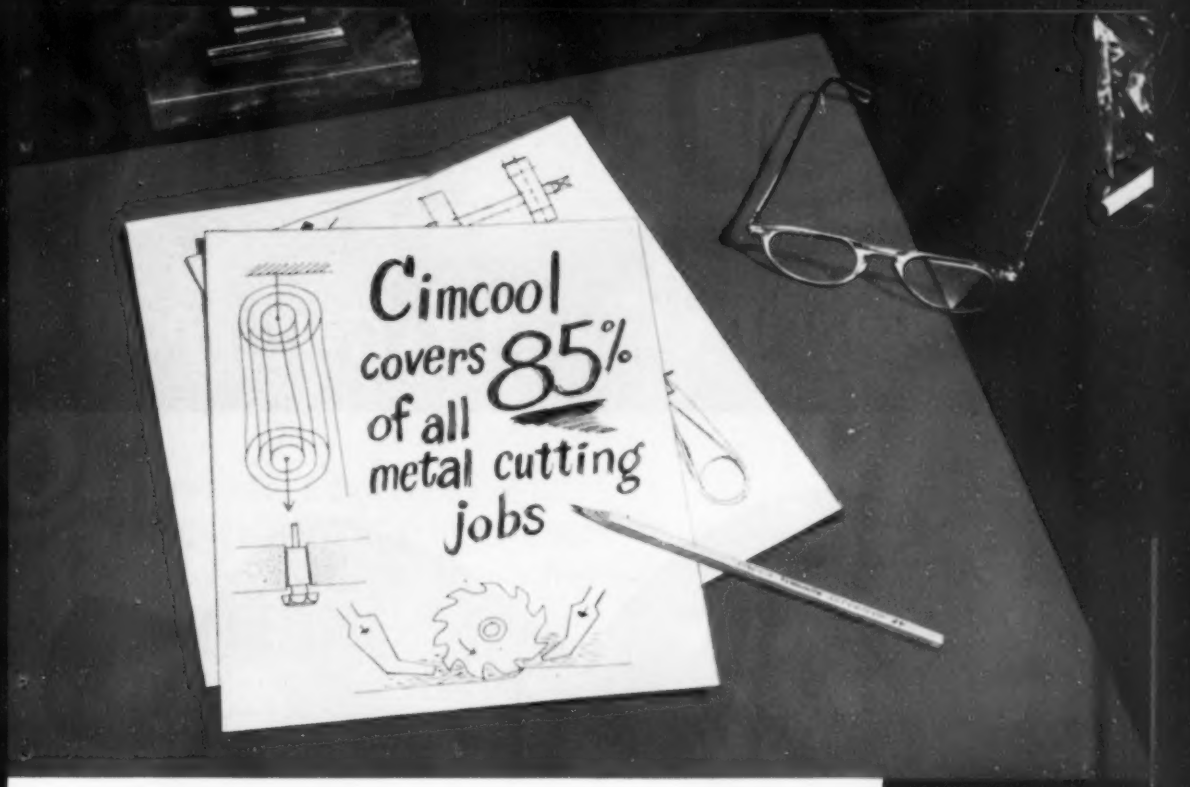
Brown & Sharpe

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Johansson Gage Blocks • Electronic Measuring Equipment • Permanent Magnet Chucks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U.S.A.

WE URGE BUYING THROUGH THE DISTRIBUTOR

WRITE FOR COMPLETE INFORMATION ON ANY OF THE BROWN & SHARPE PRODUCTS LISTED ABOVE



Worth Thinking Over

AND WORTH SWITCHING OVER to Cimcool® for this radically new and different cutting fluid also lowers costs . . . permits faster speeds . . . increases accuracy . . . helps increase tool life.

Cimcool is superior to old-fashioned coolants because it is a chemical emulsion. It replaces all water emulsions and all but a few highly compounded specialty oils. Cimcool permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained. It's longer lasting in machines. So Cimcool reduces downtime and cuts labor costs for cleaning and changing.

For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "CIMCOOL Defeats Heat." Address Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U. S. Pat. Off.

for 85%
OF ALL METAL CUTTING JOBS

NIAGARA

Outstanding Clutch Performance

Available on Niagara Geared

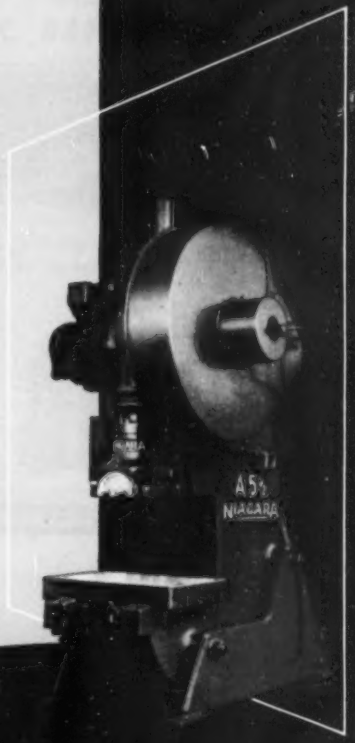
INCLINABLE PRESSES
HORN PRESSES
DEEP THROAT PRESSES
STRAIGHTSIDE PRESSES
GAP FRAME PRESSES

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

Electrically Controlled Air Actuated
SLEEVE CLUTCH

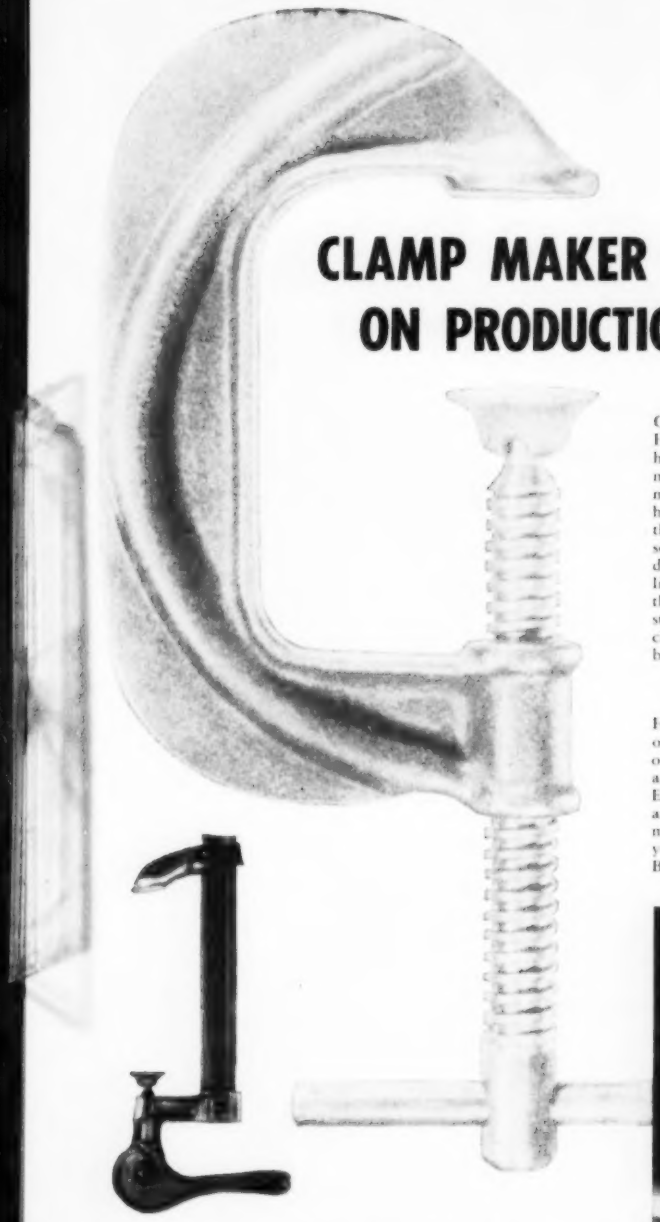
PROVIDES ECONOMY AND EFFICIENCY OF OPERATION
for presses with high frequency clutch engagement

- **ASSURES POSITIVE DRIVE,** no slippage.
- **HAS NO FRICTION SURFACES** to heat up or wear.
- **IS SMALL IN DIAMETER** and therefore has low inertia, thus minimizing power lost in starting and stopping.
- **RUNS IN A BATH OF OIL** to reduce wear.
- **HAS LOW AIR CONSUMPTION** which reduces operating costs.
- **LOCATED AT END OF SHAFT** so that it can be quickly and easily disassembled for inspection and servicing without removing clutch gear.
- **HAS FEW MOVING PARTS**... integral jaws and splines resulting in reduced maintenance costs.
- **HAS SINGLE SOLENOID VALVE** to control air flow to both clutch and brake, preventing overlap of clutch and brake action, a distinct possibility when separate solenoid valves are used.
- **PROVIDES EFFORTLESS OPERATION** with palm button or foot switch.
- **PROVIDES INSTANT ENGAGEMENT OR DISENGAGEMENT** at any point in the stroke.
- **CAN BE SINGLE STROKED, JOGGED** or operated continuously.
- **CAN BE STOPPED INSTANTLY** by stop button, electric eye, limit switch or similar device.
- **STOPS AUTOMATICALLY** if electric current or air pressure fails, an important safety feature.



Manufacturers of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

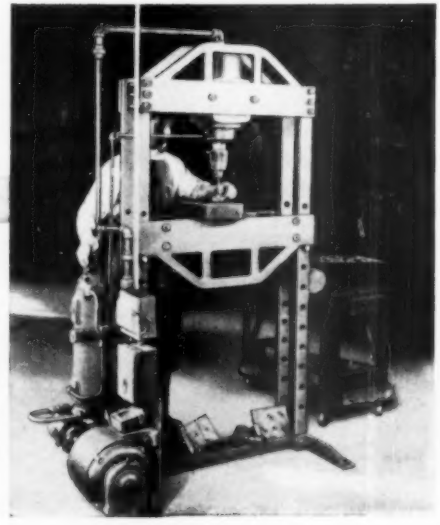
DISTRICT OFFICES: DETROIT • CLEVELAND • NEW YORK • PHILADELPHIA



CLAMP MAKER PUTS THE SQUEEZE ON PRODUCTION BOTTLENECKS!

BATAVIA CLAMP CO., makers of eccentric and C-clamps, bought a 50 ton motor driven KRW Hydraulic Press to do one job — set rivets in the heads of eccentric clamps. Then, like hundreds of manufacturers, they found they had gotten much more than they bargained for. They had been having trouble with loosening of T-handles on their C-clamps. Their new KRW Press offered this solution: Drill the pin hole 1/64" undersize and drive the pin in place with the Press. It worked like a charm. Straightening C-clamps that bent as they cooled, resizing distorted plungers and straightening distorted cams and feet on eccentric clamps — these are just a few of the production bottlenecks remedied by their KRW Hydraulic Press.

YOU'D be surprised how many ways a KRW Hydraulic Press can save you money on your operations. Available in 25 to 150 ton capacities, one, two or three cylinder models, KRW Hydraulics are the most versatile presses on the market. Easily converted in minutes from one set-up to another. Self-contained above ground, they come in motor, air or hand operated types. Check with your machinery dealer or get in touch with us in Buffalo. Write, wire or phone Dept. 11.



K · R · WILSON

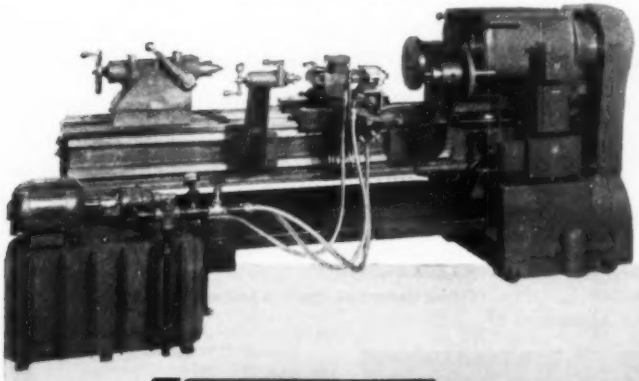
215 MAIN STREET BUFFALO 3, N.Y.

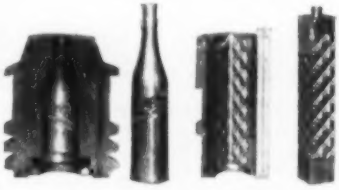
WITH SPRINGFIELD HYDRAULIC REPRODUCER

Now you can secure ***accurate*** three dimensional contour reproductions with the completely hydraulic, super-sensitive Springfield Reproducer on Springfield Geared Head Lathes. Reproduces internal, external, and face contours using a master, a template or the piece itself. Holds reproduction to extreme limits of accuracy.

Its usefulness and versatility are remarkable—it will trace a compound curve, follow the flats of a square milk bottle, profile and write simultaneously, bring out every detail of the most intricate design, turn a straight, smooth taper on a bar, cut a perfect spiral or a large cam and perform many similar money-saving, time-saving jobs that come up constantly.

Write today for catalog and complete information. We will gladly demonstrate on your work to show what the Springfield Reproducer will do.





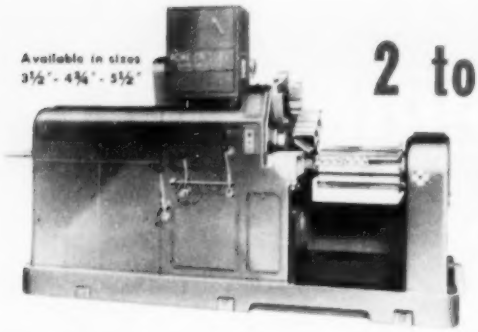
Just two examples from many of the accurate reproductions from Springfield Reproducers. Letters and figures reproduced from the master; intricate designs reproduced on flat surfaces.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON ST., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

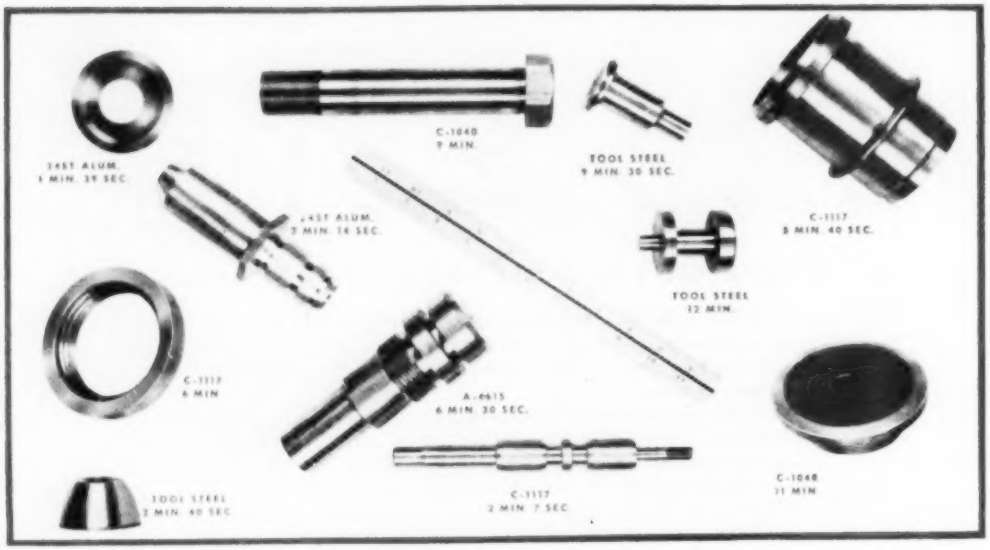


2 to 10 Times Faster!

that's the production increase you can expect when you switch to the new

ACME-GRIDLEY MODEL M

Single Spindle Automatic



Can your present machining methods measure up to these proved examples of Model M production?

Parts shown range up to 8" long and 4" diameter. Lots run as low as 250 pieces, as high as 70,000. These parts, and hundreds of others, were switched from ordinary single spindle machines to the Model M. Here's why:

▶ Eight independently operated tool slides permit use of speeds and feeds best suited to each cut, using carbide or high-speed cutting tools.

▶ Three automatic spindle speed ranges provide correct surface speed for a wide range of diameters.

▶ Turret indexes independently. Several short end operations can be performed while heavy forming cuts are being made from the side slides.

▶ Rugged, open frame provides ample strength to take full advantage of carbide tools, yet plenty of room for chip clearance and easy tool adjustment.

▶ Easily accessible camming minimizes change-over time on small-lot setups—and one man can run several machines.

Get our guaranteed figures on your work—make the comparison

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

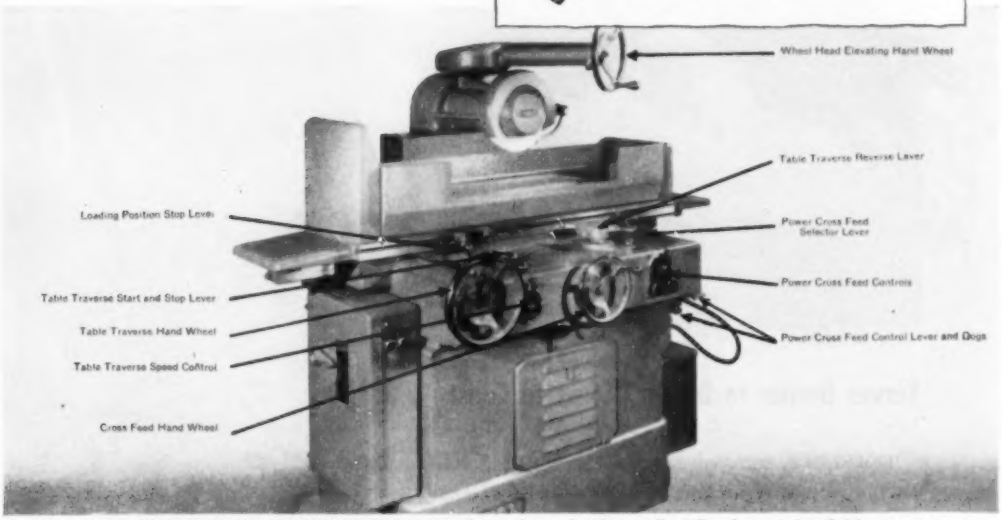
Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

Easy to set-up... Easy to operate...

This 8" Norton Surface Grinder

cuts unit costs on all kinds of jobs!

☑ production or tool room
☑ military or civilian


Wheel Head Elevating Hand Wheel
Table Traverse Reverse Lever
Loading Position Stop Lever
Power Cross Feed Selector Lever
Table Traverse Start and Stop Lever
Power Cross Feed Controls
Table Traverse Hand Wheel
Power Cross Feed Control Lever and Dogs
Table Traverse Speed Control
Cross Feed Hand Wheel

NOTE SIMPLICITY AND CONVENIENT GROUPING of controls on the Norton 8" x 24" surface grinder. Quick set-up cuts your unit costs . . . makes "breaking in" of new production help far easier.

Here's a rugged machine that sets up quickly and maintains accuracy on production runs. But it's also efficient for grinding a variety of small units in tool room work. Its quick set-up saves you time from job to job.

It's a wise investment for you *now* because it's good for special military contract work . . . and just as good later for your "civilian" production. Investigate this great new grinder and its companion machines, the Norton 6" and 10" hydraulic surface grinders.

Remember — only Norton offers you such long experience in both grinding machines and wheels to help you produce more at lower cost. And Norton also offers you the world's most complete line of grinding machines.

We'll be glad to discuss your present problems or your plans for "post emergency" production, fitting tentative delivery schedules into your plans for the future. In the meanwhile . . . .

Write for 12-page Catalog 190 describing the Norton 8" x 24" surface grinder. NORTON COMPANY, Machine Division, Worcester 6, Mass.

***To Economize Modernize With* NEW**

NORTON

GRINDERS and LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

Red Shield now in Texas

Serves Border to Border, Coast to Coast

COMPLETE, fast and accurate service on Shield Brand cutting tools is now provided for Texas and the Southwest through our new branch at Dallas.

Today, from five branches and our headquarters in Cleveland, we provide nationwide, an unexcelled Service of Supply on Shield Brand cutting tools.

Ask your local Industrial Supply Distributor for Standard Shield Brand Tools. They are Foremost Quality and promptly available.

STANDARD TOOL CO. 3950 CHESTER AVENUE CLEVELAND 14, OHIO

New York • Detroit • Chicago • Dallas • San Francisco

STANDARDIZE AND SAVE WITH STANDARD RED SHIELD METAL CUTTING TOOLS. THERE IS A STANDARD DISTRIBUTOR NEAR YOU AND READY TO SERVE YOU.

BULLARD

MANUFACTURERS OF MACHINE TOOLS

Boeing B-47 Stratojet medium bomber — Boeing Airplane Co. Photo

The Invisible Background of Industrial Progress

Today's planes contact inaccessible corners of the world taking foods, lifesaving medicines and important materials quickly to famine ravaged areas, the frozen north and flood stricken districts. Distance in terms of time is only a matter of hours and fractions thereof. In one day of flying, surveyors and engineers accomplish work that once took months. Planes such as the Boeing illustrated here, increase our strength for defense and give us greater assurance of Freedom and continuance of the American Way of Life. . . . Faster flying demands stronger construction, tougher and heavier materials. The wing of one American fighter plane can support approximately 150 tons of dead weight. The skin panels of B-47 Stratojet wings are machined for maximum strength, and jet engines running at temperatures up to 1800° F require new heat resistant alloys. . . . In the Invisible Background of Industrial Progress — ★*Modern Machine Tools* take their place in the manufacture and maintenance of America's huge commercial and military air arm.

In this Invisible Background The Bullard Company is playing an increasingly important part.

THE BULLARD COMPANY
BRIDGEPORT 2
CONNECTICUT

★ *For greater manufacturing economy REFER to next page*

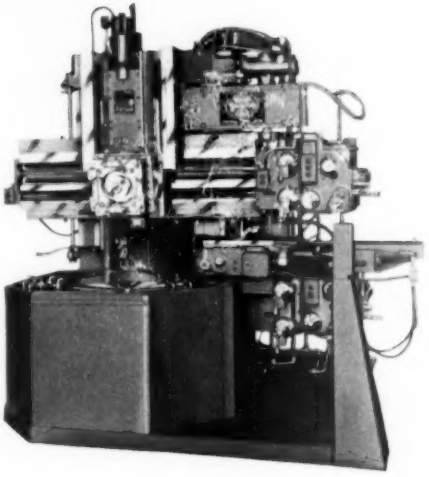
BULLARD MACHINE TOOLS
FOR GREATER MANUFACTURING ECONOMY

Man-Au-Trol — the word being derived from Manual or Automatic Control — has been found in actual service to possess many unique advantages over many previous methods of machining. Built into the Bullard Vertical Turret Lathe as a basic unit, the combination of this control with a sturdy base machine provides a fine degree of accuracy and a highly efficient production method.

Shortly after the introduction of the Man-Au-Trol Vertical Turret Lathe to the industries it was found that the machine and its tooling provided an economical and highly productive single spindle unit for the larger and heavier types of jobs requiring fine finish and a high degree of repetitive accuracy.

Man-Au-Trol Vertical Turret Lathes working today on high production for the defense program will readily and profitably adapt themselves to the easier pace of normal manufacturing procedures.

Versatility is only one of the many advantages of these machines and it will pay you now and in the future to investigate their possibilities in your plant.



Bullard Man-Au-Trol Vertical Turret Lathe — another step toward Greater Manufacturing Economy. Built in 30-, 36-, 42-, 54-, 64-, and 74-inch sizes.

BULLARD

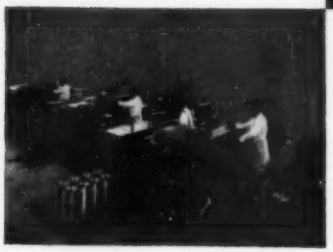
THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT

33% time saved...

on complicated TANK part...with

LODGE & SHIPLEY COPYMATIC LATHE



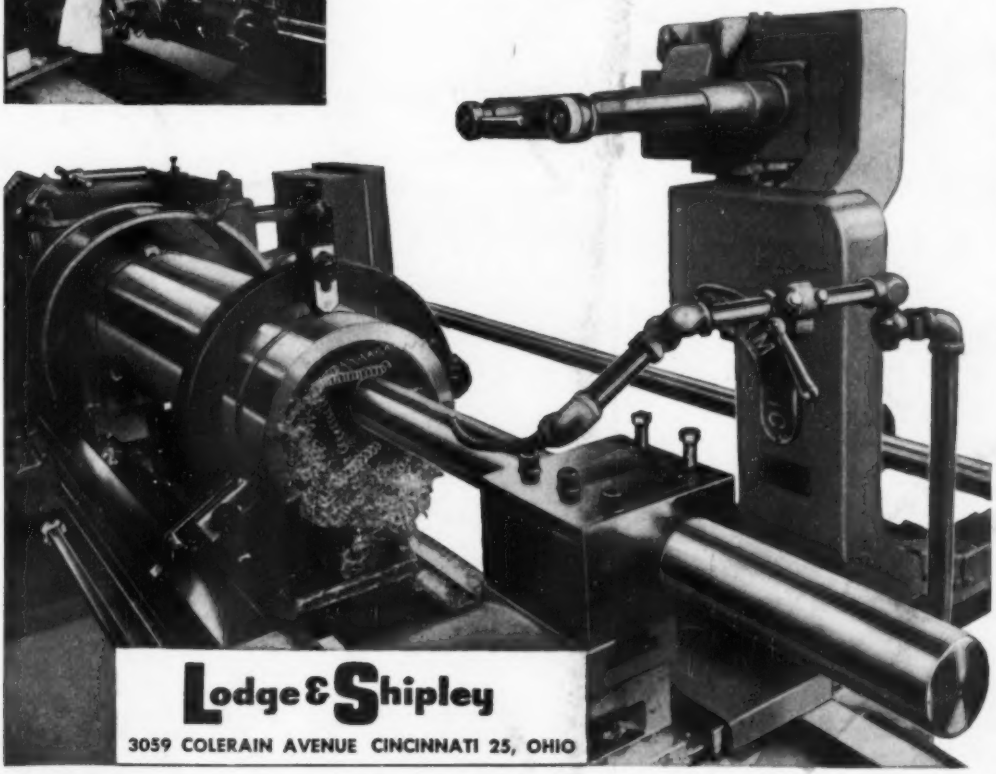
3 out of 4 lathes at MAGNA MILLS PRODUCTS Southgate, California, are LODGE & SHIPLEY

Specializing in the machining of large forgings, extrusions, die castings and tooling, this "high precision" machine shop chose Lodge & Shipley to do their lathe work.

A typical job, illustrated here, is the rough and finish contour boring of a large dural extrusion for a tank sub-contract, using a "Model X" 20" x 102" COPYMATIC. At 171 RPM, .025"/rev. feed is used for the rough operation, .008"/rev. feed for the finish. Floor-to-floor time on the complicated job is just 5 hours . . . a 33% saving in time!

You will find, just as this user has, that the Lodge & Shipley COPYMATIC is an "accurate and good all-around production lathe." Ask for a detailed explanation of how COPYMATIC combines the speed and convenience of automatic duplication with proven Lodge & Shipley "Model X" accuracy and efficiency.

Write for Bulletin No. 675 and other case histories.



Lodge & Shipley

3059 COLERAIN AVENUE CINCINNATI 25, OHIO

LITTLE TAPS FOR *Big* JOBS

You get more work and better size control when using WINTER *Balanced Action* Machine Screw Taps. These little taps do big jobs.

WINTER BROTHERS COMPANY
Rochester, Michigan, U. S. A.

Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco. Division of National Twist Drill & Tool Company.

ALWAYS AT YOUR SERVICE

Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.

Economize

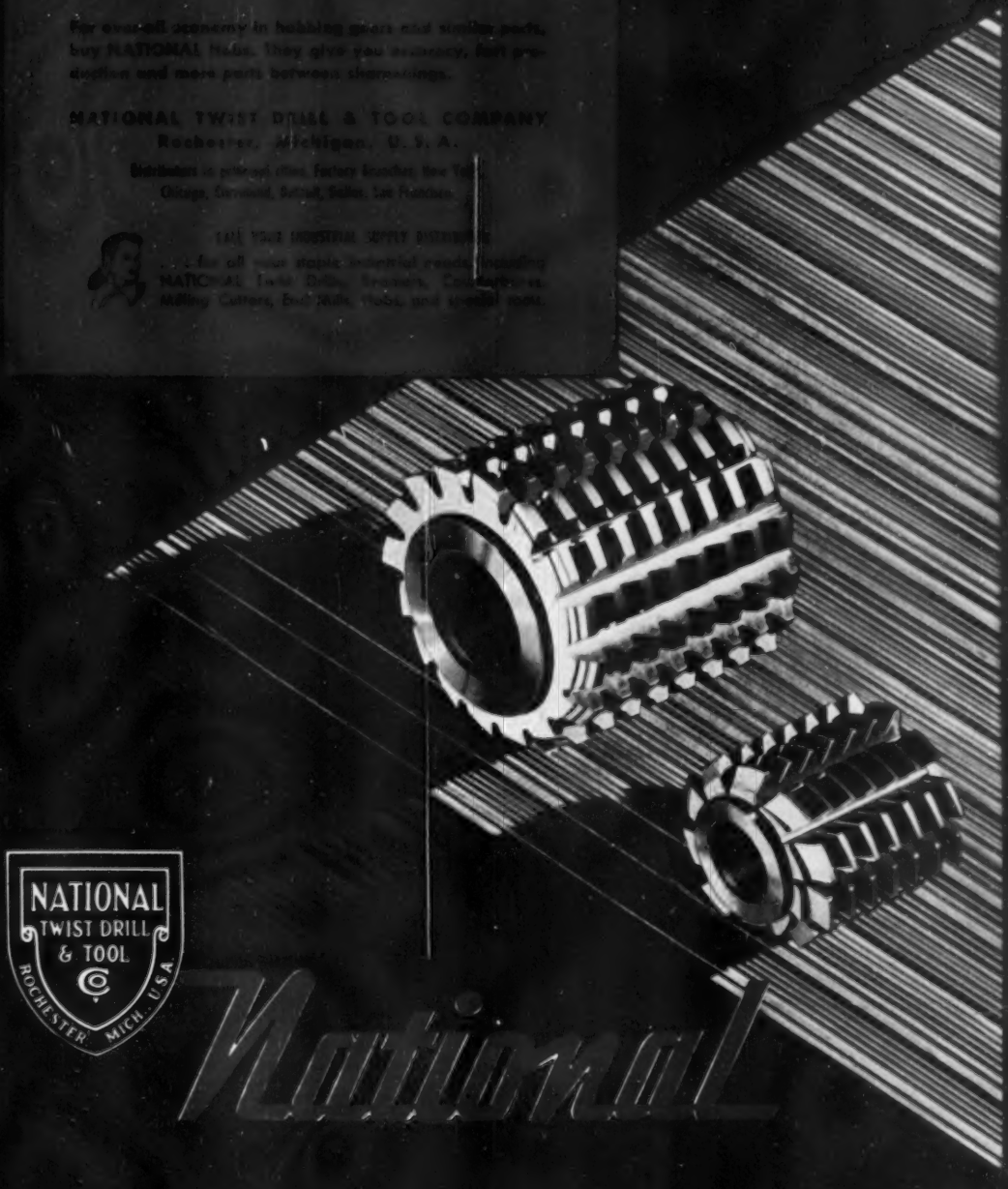
WITH NATIONAL HOBS

For overall economy in hobbing gears and similar parts, buy NATIONAL Hobs. They give you accuracy, fast production and more parts between sharpenings.

NATIONAL TWIST DRILL & TOOL COMPANY
Rochester, Michigan, U. S. A.

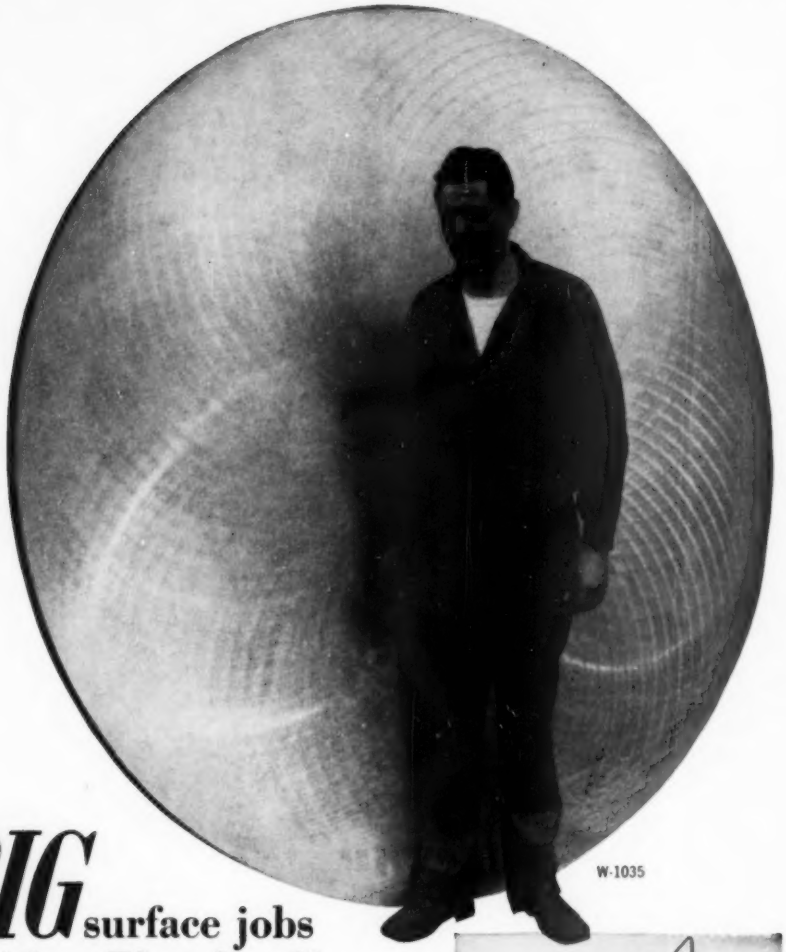
Distributors in principal cities. Factory branches: New York, Chicago, Cincinnati, Detroit, Dallas, San Francisco.

CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR
... for all your regular industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and special tools.



NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH. U.S.A.

National

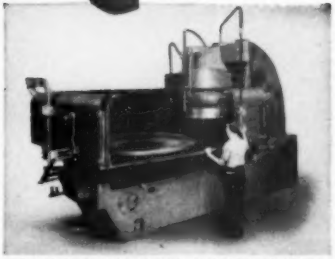


W-1035

Those *BIG* surface jobs are easy with a Blanchard!

No other machining method can match the speed, economy and quality of Blanchard Grinding on large flat surface work. This 88" diameter, cast iron plate, for example, was rough ground in 3½ hours, floor to floor. *¼" of stock was removed from one side —a total of 1520 cu. in.—380 pounds!*

After normalizing, finish grinding on the Blanchard produced a water-tight joint, with a Blanchard ground mating service, each being flat within .001". Why try to machine your large work with time-consuming methods, when Blanchard Grinding offers such speed, economy and quality with surprisingly low wheel costs?



NO. 42-72-84 BLANCHARD SURFACE GRINDERS

Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

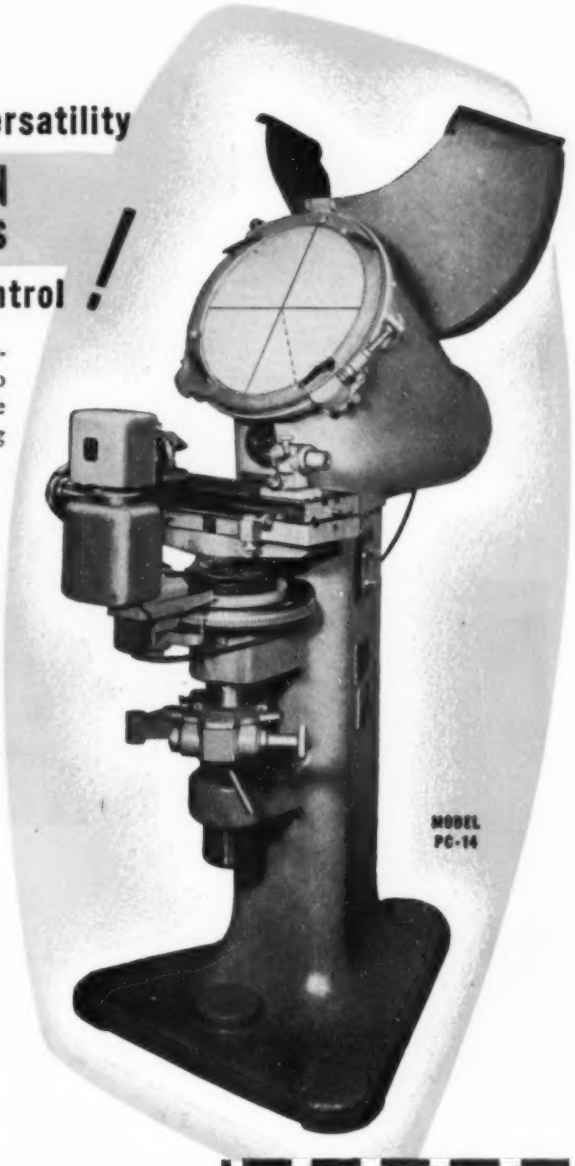
Unsurpassed Inspection Versatility

JONES & LAMSON
OPTICAL COMPARATORS

The Essence of Quality Control !

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline — and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct — *without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.



P.S. → Jones & Lamson Comparators guarantee swift, sure QUALITY CONTROL *throughout your production lines.* Write Dept. 710 for Catalog No. 402. One of our ELEVEN models will fit your needs.

JONES & LAMSON
JONES & LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

Machine Tool Craftsmen Since 1835
COMPARATOR DIV.
Dept. 710

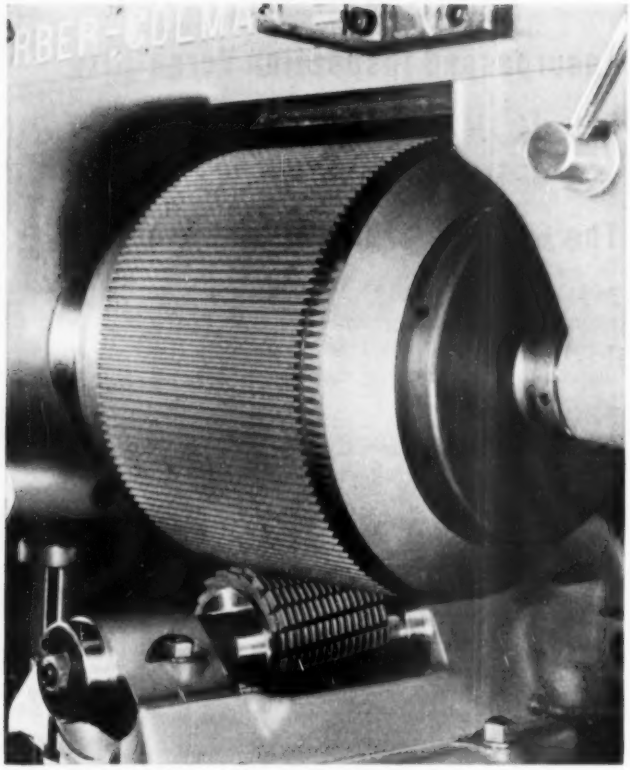
Jones & Lamson Machine Company
Springfield, Vt., U.S.A., Dept. 710
Please send Comparator Catalog No. 402.

NAME _____ TITLE _____

COMPANY _____

STREET _____

CITY _____ STATE _____



Barber-Colman HOBBING BOOSTS RING GEAR PRODUCTION!

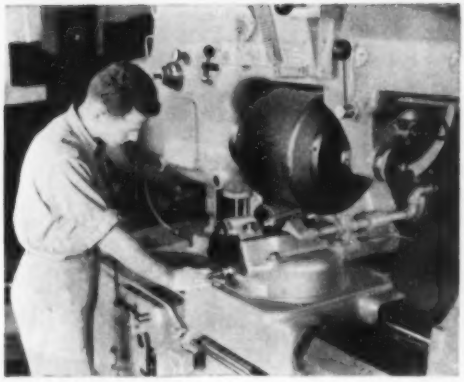
1 Gear Every 1-1/2 Minutes

This Barber-Colman No. 14-15 Hobbing Job is typical of how Engineered Hobbing pays off on gear production problems. These flywheel ring gears are nearly 15″ in diameter, with 146 teeth and .375″ face width. They are hobbed 24 per load at the rate of 36 minutes floor-to-floor, or 1-1/2 minutes per gear. Blanks are formed by rolling flat stock into a ring and butt-welding. The rings are then mounted on specially-designed work arbors and hobbed at .100″ feed per revolution and 75 hob rpm.

BUILDERS OF PRECISION GEAR

2300 Gears Per Hob Life

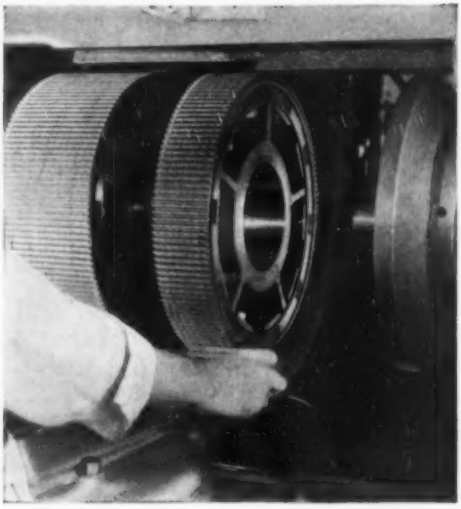
On this job 2300 gears are cut per hob — about 195 pieces per sharpening. Low-cost unground Multithread hobs are used. Multithread design, with its increased indexing speed, has reduced total time to 1-1/2 minutes per gear. Fast loading and automatic hobbing cycle reduce operating costs to a minimum.



ENGINEERED HOBBING PAYS OFF!

Tooling Suits Specific Problems

Barber-Colman Engineers designed special mandrels to hold 8 of these large diameter blanks per load. The mandrels are mounted three on the arbor (24 blanks) for each cutting cycle. Blanks are pressed onto the mandrel prior to hobbing, thus reducing loading time between cycles. A special loading fixture aids the operator in lifting and positioning the mandrels on the arbor.



Fast, accurate gear hobbing — with tool costs far below comparable methods — gives you the best possible approach to high-production gear output. Rigidity of the Barber-Colman No. 14-15 Hobbing Machine allows the use of high feed rates and the fast indexing which is inherent with Multithread hobs. Special tooling eliminates job kinks and difficulties. Let Engineered Hobbing work for you, too. Call your Barber-Colman representative and ask him for recommendations on your gear cutting operations.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

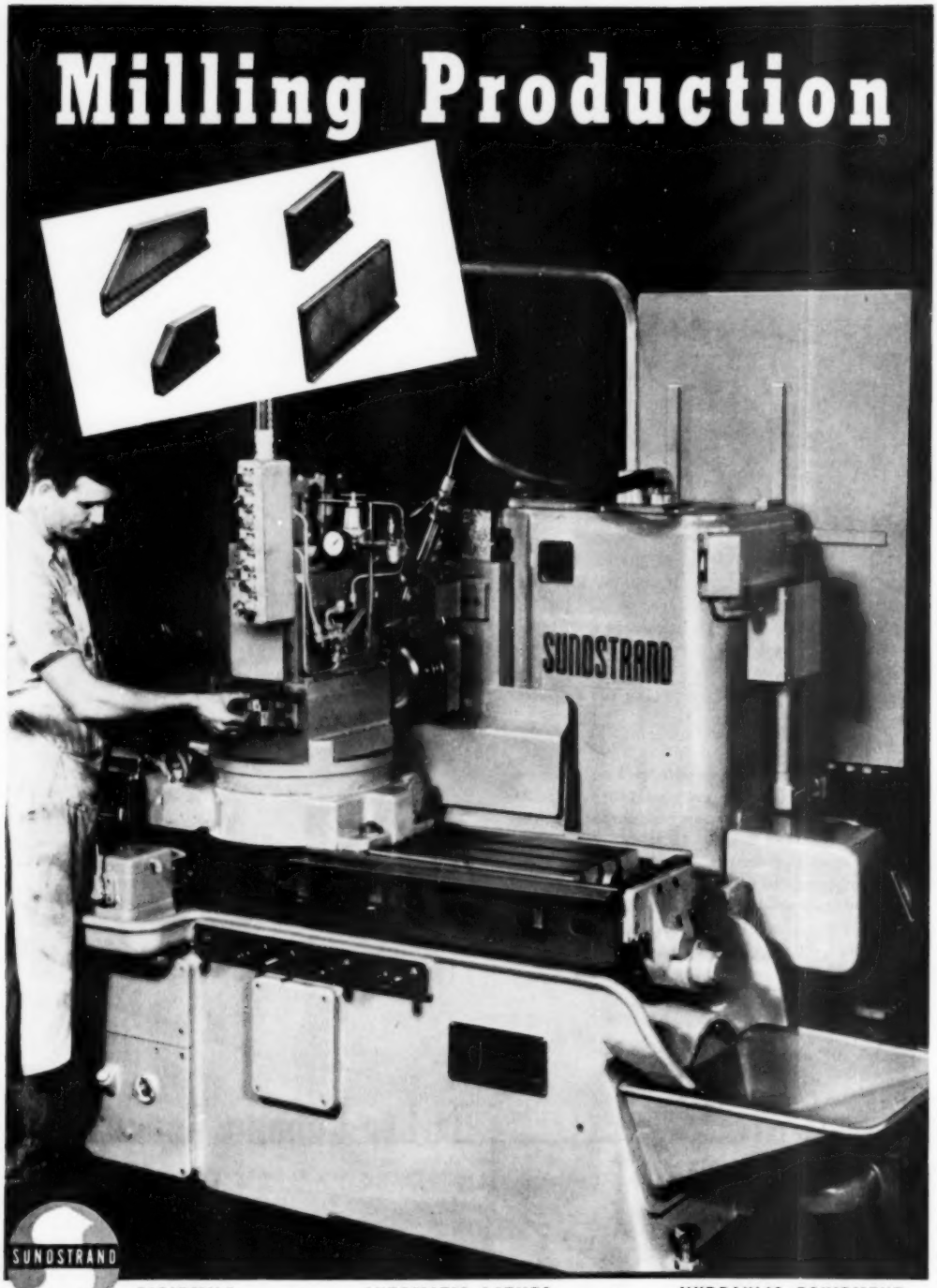
BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 616 ROCK STREET, ROCKFORD, ILLINOIS, U.S.A.

HOBS AND MACHINES SINCE 1911

Milling Production



SUNDSTRAND

RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

Increased 6 Times...

On a SUNDSTRAND Rigidmil with Automatic Index Base

The Wetmore Reamer Company uses a Sundstrand model 33 Rigidmil to mill the cone angle and top of high speed steel reamer blades. Because of the power and rigidity of the Sundstrand Rigidmil the rate of feed has been increased 4 times over former method. Also with the new method of holding, 17 blades are milled in one pass as compared to 11 by the former nethod. In addition, use of an automatic index base and a power fixture provides free loading time and faster and easier operation.

Features that Make Rigidmils More Productive

Over the past years there has been a constant improvement in productive design features on Sundstrand Rigidmils. These improvements are the result of our close work with industry in building efficient cost-cutting machinery to meet the ever present demands for progress. Some of the more important design improvements in Sundstrand Rigidmils are listed below. Check these against your present milling equipment.

1. *Wider Speeds*
Every Rigidmil has a wide selection of feed rates to accommodate various types of metals.

2. *Wider Range of Feeds*
to meet most production requirements in all types of metals.

3. *Larger Quills*
are provided to facilitate carbide milling with greater horsepower.

4. *Heavier Heads For Greater H.P.*
and to maintain greater accuracy at high production.

5. *Larger Working Areas*
to hold more parts or longer parts in one cycle.

6. *Better Materials*
used throughout all Rigidmils.

7. *Hardened Steel Ways*
to insure consistent accuracy in machining.

8. *Climb Milling*
to accommodate cycles where loading and unloading can be done while milling.

9. *Automatic Lubrication*
to cut down maintenance costs, simplify operator's duties.

10. *Fast Rapid Traverse*
to minimize non-cutting time of machine.

11. *Larger Coolant Supply*
to accommodate long periods of production machining.

12. *Automatic Cycles*
to minimize operator's duties and facilitate production milling

FREE
Additional Data

This book will give you many suggestions for production milling methods. Standard, semi-standard and special machine applications to milling problems are described in detail. Write for your copy today. Ask for bulletin 122.

SUNDSTRAND

SUNDSTRAND
Machine Tool Company
2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

GISHOLT

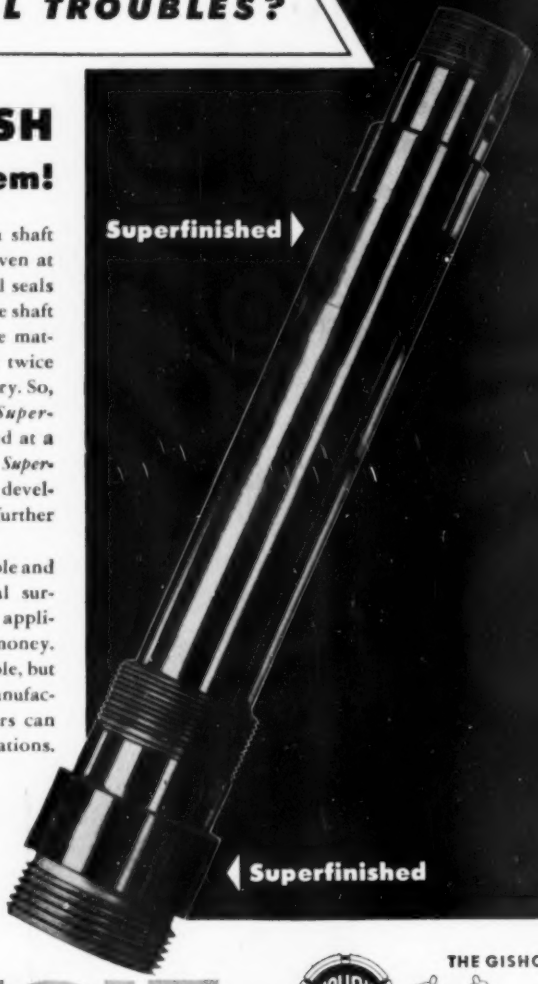
do you have
OIL SEAL TROUBLES?

SUPERFINISH
can solve them!

Here's a typical case where a shaft with ground surfaces was driven at a speed of 1750 r.p.m. The oil seals created enough heat to burn the shaft and stop the motor. To make matters worse, it was found that twice the original speed was necessary. So, the oil seal surfaces were *Superfinished*, and the shaft operated at a speed of 3500 r.p.m. With the *Superfinished* surfaces, no heat was developed at this higher speed. No further trouble was encountered.

Superfinishing is a quick, simple and inexpensive process. Oil seal surfaces are but one of the many applications where it can save you money. Not only can it eliminate trouble, but often it can help you reduce manufacturing costs. Gisholt engineers can advise you regarding its applications.

Write now for the booklet "Wear and Surface Finish."



THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

How to solve 39 PRODUCTION PROBLEMS with Mead Air Devices

SEE how to use standard Mead units to make automatic or semi-automatic machines!

New 16-page Mead PHOTO-BOOKLET presents actual examples in pictures and text of 39 different, tough production problems solved by various combinations of Mead Air Operated Devices. This interesting booklet shows how to:

(1) De-burr small parts fast **(2)** Press 3 components together **(3)** Tap die cast knobs **(4)** Insert rubber discs into metal cups for insecticide "bombs" **(5)** Swage hubs to hypodermic needles **(6)** Ream center hole in valve plate **(7)** Broach 2 internal slots in brass valve inserts, handling 4 sizes **(8)** Press filters into copper shells and indent dimple in shell **(9)** Tap 2 holes $\frac{5}{8}$ in brass brush holders. **(10)** Drill and tap a 1/4-20 hole 9.16 deep then ream "bell-mouth" in stainless steel forging **(11)** Drill and ream a hole to controlled depth in brass valve body. **(12)** Drill No. 52 hole thru end of solid graphite pencil. **(13)** Press plastic liners into perfume bottle caps **(14)** Drill cast iron gas burners **(15)** Drill $\frac{1}{16}$ hole thru steel axle of fishing reel **(16)** Carry copper rods thru series of gas flames to braze special tips to lower ends. **(17)** Chamfer hole in spark-plug bodies approx. 3,600 per hour **(18)** Swage steel ball into brass nose of ballpoint pen approx. 3,600 per hour **(19)** Assemble patented brass couplings and flare neck into nut to simultaneously form fluid-tight seat **(20)** Drill twin holes in chain-saw teeth **(21)** Counter sink both sides small washers, wheels, rollers approx. 4,000 per hour. **(22)** Press shafts, bushings into plastic knobs **(23)** Drill and tap 5-40 threads in rectangular brass electric terminals, approx. 2,400 per hour **(24)** Crimp together 2 thin spring members of pen assembly **(25)** Press brass shells over cast iron cores of doorknob assemblies **(26)** Crimp saddles to plastic radio tube sockets **(27)** Stamp trademark on brass plugs approx. 3,600 to 4,000 per hour **(28)** Press ferrules on wood handles **(29)** Assemble paper hangers' tool roller to yoke by inserting pin thru collar **(30)** Feed, spin finials onto screw of lamp shade holder **(31)** Crimp eyelet and ring on pen barrel **(32)** Drill and tap 2 holes 8-32 in aluminum BX connectors **(33)** Drill $\frac{1}{8}$ hole in aluminum part, chamfer both top and bottom of hole, approx. 2,000 per hour **(34)** Cap cathode tubes for TV sets at 3,200 per hour **(35)** Fill pen tubes with ink, insert ball point assembly at one pass **(36)** Bend precut copper tubes 90° at 4,000 per hour **(37)** Drill 2 holes in brass castings, fed to 2-spindle drill head **(38)** Hold plastic bead, drill hole, eject **(39)** Drill bushing for 2 size clevis pins.

MEAD SPECIALTIES COMPANY, Dept. MA-82, 4114 No. Knox Ave., Chicago 41, Ill.

TEAR OUT MEMO COUPON FOR YOUR COPY . . .

Memo Coupon

MEAD SPECIALTIES CO.
4114 N. Knox Ave., DEPT. MA-82, Chicago 41, Illinois
Send new MEAD PHOTO BOOKLET "Air Power At Work" specially printed in green and black.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

This "mirror" is formed by the surface of the exclusive new Fosdick Superfinished Column. So smooth and shiny, a man can actually use it for shaving, it seals out rust and corrosion, virtually eliminates scoring and column wear. Now standard on all Fosdick Economax Hydraulic Radials, the new superfinished column adds to the long life and accuracy of these machines, helps give your drilling costs a *real* shave.

Other features that have made Economax Hydraulics a favorite among Radials include hydraulic centralized controls and safety interlocks, automatic lubrication, the hydraulic non-twist column clamp and many more. Call your Fosdick Distributor today for the whole story or write for Bulletin RDA.

RADIAL DRILLS
SENSITIVE AND UPRIGHT DRILLS
JIG BORERS

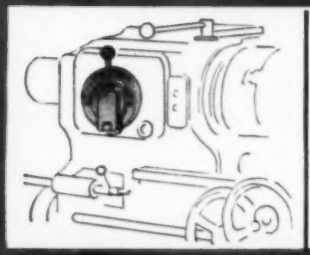
THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

AUTOMATIC POSITIONING MACHINES
SENSITIVE RADIAL DRILLS

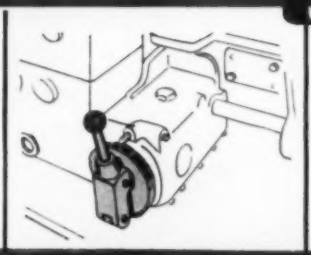
FOSDICK

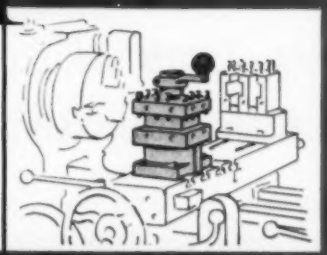
another reason why J&L turret lathes produce

MORE CHIPS PER TOOL
MORE PIECES PER HOUR
MORE PROFIT PER JOB

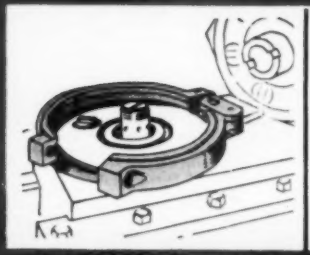


Single lever speed and feed selectors—preselector type.

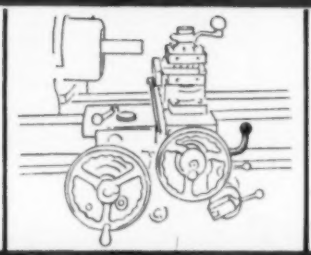




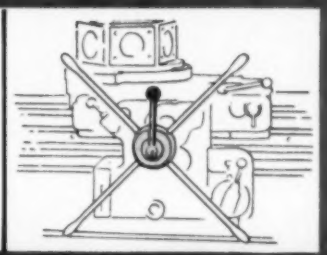
Quick indexing—self-locking—square turret.



Automatic clamping of hexagon turret.



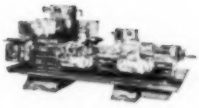
Power rapid traverse for cross slide.



Two-speed power traverse of saddle and power indexing of hexagon turret on all saddle type machines.

MORE EASE OF OPERATION!

J & L Turret Lathes are the easiest to operate, because controls are fewer, simpler and easier to reach. The operator can select the speed and feed for the *next* cut while machine is operating. Power rapid traverse for the cross slide, two-speed power traverse for the saddle and power indexing of the hexagon turret, also help take the strain off the operator and increase your production.



P.S. Power bar feeds and chucks, and power torque chuck wrenches are also available. Write to Dept. 710 for Catalog.

"World's most accurate and powerful turret lathes"

RAM TYPES: Bar, 1½" to 4½", Chuck, 10" to 12". SADDLE TYPES: Bar, 2½" to 5", Chuck, 12" to 18".

JONES & LAMSON

Machine Tool Craftsmen Since 1835

J&L TURRET LATHE DIV.

JONES & LAMSON MACHINE CO., Springfield, Vt., U.S.A.

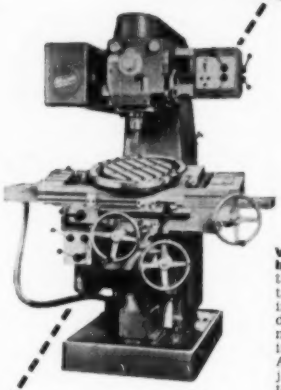
AVAILABLE FROM STOCK

Delivery helped sell these tools . . . now Industry's sold on their performance

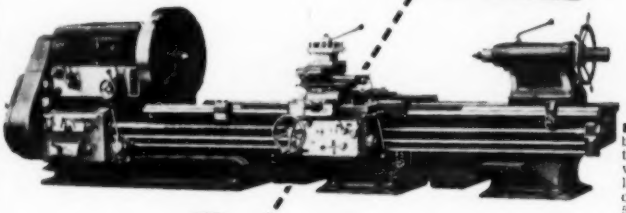
Production-minded plants want more than just delivery on machine tools – foreign or domestic. They want performance and reliable servicing–and they're getting both – reordering these German precision-built tools. Write for complete details.

Twist drill life increased 10 times by user of CAWI TWIST DRILL GRINDERS . . . says savings in drills, less tool changes, more and smoother holes per grind, faster cutting and no reaming, will soon pay machine cost.

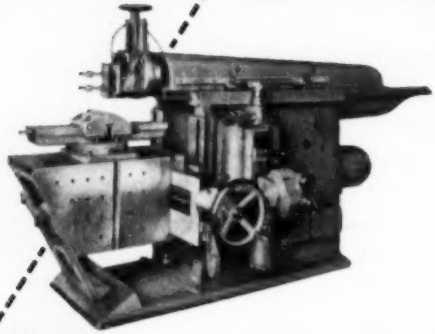
In a single revolution of its drive head, the Cawi planetary gear system turns a two-lip drill through $1\frac{1}{2}$ revolutions on its own axis, bringing each lip alternately in contact with the grinding wheel and thus producing concentric, uniform drill lips. For three-lip drills, the ratio is $1\frac{1}{2}$ to 1. For wet or dry grinding drills 1/16" to 1" diameter.



Vertical milling, downfeed milling and jig boring in one machine. In one set-up of the HURTH V10a, longitudinal traverse of tiltable worktable handles vertical milling; longitudinal traverse and graduated downfeed of cutter spindle does downfeed milling; spindle downfeed does jig boring. A precision performer in leading American plants, producing close-limit jigs, fixtures, gages, etc.; also adaptable to production runs. 13 spindle speeds, 45-2800 rpm; table $39\frac{1}{4}$" x $11\frac{3}{8}$". Also specially engineered HURTH LFV vertical millers for slotting, recessing and keyways; equally adaptable for normal milling. Table sizes: 48" x $13\frac{3}{4}$" and $34\frac{1}{4}$" x $10\frac{1}{2}$".



Extra Heavy-Duty Lathes . . . Precision-built to American standards by internationally known VDF Works. Two models with $30\frac{1}{4}$" and $48\frac{1}{4}$" swing; turning lengths, 20' and 22' 11"; maximum weight of work 6 tons and 10 tons. 30 H.P. and 50 H.P. A.C. base motors.



Low-cost, High-Production Shapers . . . they amazed–and sold–ASTE Show visitors who saw the KLOPP's unusual speed and capacity for removing metal. Now cutting costs in 15 U.S. plants. Awkward-to-handle, bulky workpieces are easily accessible and simple to set up–because the head travels to the work. Stroke lengths, Mechanical $16\frac{3}{4}$", $20\frac{2}{3}$", $26\frac{5}{8}$"; Hydraulic 26", $33\frac{1}{2}$", $39\frac{1}{2}$".

Send for current stock list

Lathes
Milling Machines
Jig Borers
Thread Grinders
Drill Presses
Shapers
Grinders
Drill Pointers
Power Hack Saws
Screw Machines
Balancing Machines
Broaching Machines

Replacement parts for all machines will be available at our Cleveland Service Center

KO CO. INC. INDUSTRIAL IMPORTERS

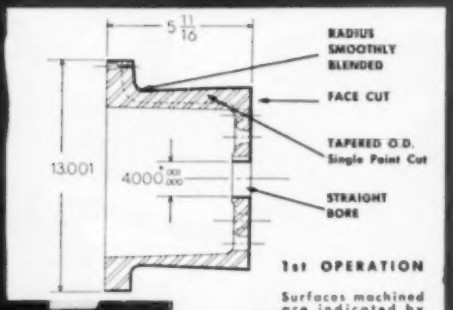
KURT ORBAN COMPANY, INC.

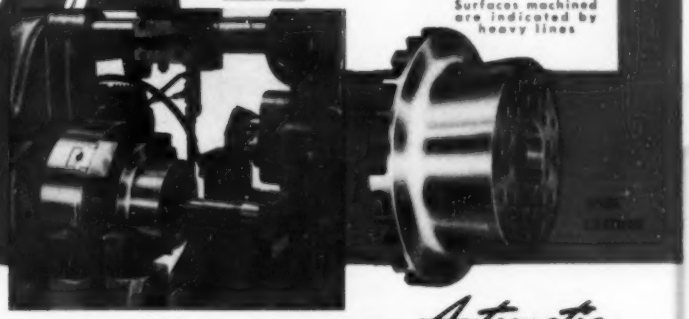
205 East 42nd St., New York 17 • 4220 Prospect Ave., Cleveland 3 • 19450 James Couzens Highway, Detroit 35

Canadian sales by European Machinery Ltd., 11 King St. West, Toronto, Canada

DOING *Hard Jobs* THE *Easy Way*

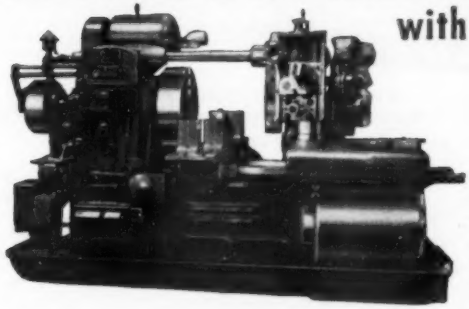
WITH SPEED..
PRECISION..
ECONOMY





calls for a

POTTER & JOHNSTON 6-DRE *Automatic Turret Lathe* with P & J TOOLING



Skillful P & J Tooling on the powerful P & J 6-DRE Automatic is a combination that adds up to increased output with high precision and lower production and labor costs on every type of work. In the set-up for the **steel casting** job shown above, the overhead pilot bar is equipped with a cam that operates a slide tool on the turret to obtain the angle with a single-point cut.

If you'd like to turn out your hard-to-machine jobs faster and better with fewer rejects and greater profits — try doing them the P & J way. Just do this: (1) Write today on your company letterhead for your copy of Bulletin No. 148 that contains ideas for the profitable machining of forgings, castings and cut-off bar stock, and (2) Ask the experienced P & J Tooling Engineers to help you. They'll be glad to recommend the best possible combination of tooling and operation sequence. There is no obligation.

Precision Tooling Production for over 50 years

POTTER & JOHNSTON COMPANY
PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF PRATT & WHITNEY — DIVISION NILES - BEMENT - POND CO.

Accurate, dependable engine and manufacturing

LATHES

Measurements in Inches and Decimals

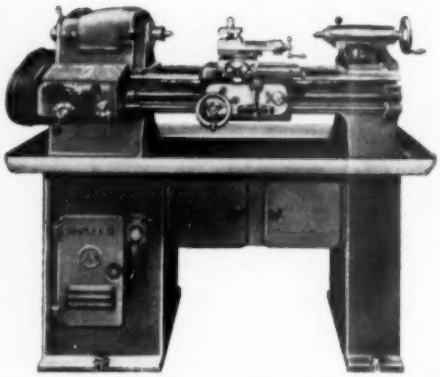
PRICED TO FIT EVERY BUDGET!

SIMPLEX 14"
Incorporates the finest workmanship possible in a lathe of its class and price; includes ground lead screw, Superfinished spindle, headstock, tail stock and many other refinements.

MOREY's 40 years of experience and reputation in the Machine Tool field confirm the high standards of these lathes in design, materials and workmanship . . . They are rigidly constructed for high efficiency and close tolerance, and will give long-time, economical service.

All machines come with ground lead screw, complete range of American Standard threads, quick change gear box, spline shafts, heavily constructed and well ribbed to guarantee minimum vibration.

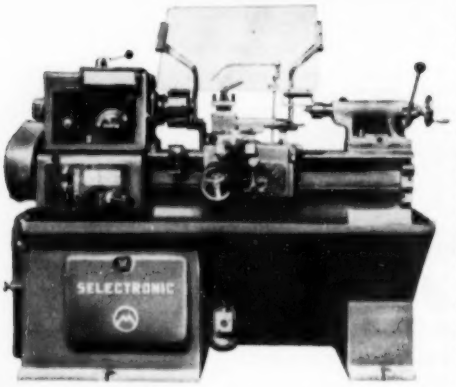
Write us now for complete details!



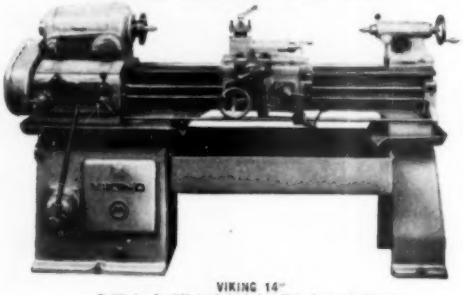
SIMPLEX 10"
Made in 10" x 20" only. It features friction ball bearing spindle.

NO PRIORITIES REQUIRED • PROMPT DELIVERY

OVER 300 MACHINES PURCHASED BY SATISFIED CUSTOMERS IN THE U.S. WITHIN THE PAST EIGHT MONTHS!



SELECTRONIC 13"
A high speed manufacturing lathe ideal for turning out parts with square shoulders, equipped with electric pre-selecting V-belt drive so the operator can pre-select the speeds for his work without loss of time. This machine is made with 3 speed ranges and has sufficient horse power for the use of carbide tools. It can be equipped with a copying attachment.



VIKING 14"
Built in 3 different bed lengths, incorporating a very unique method of changing speeds, giving a full range of speeds from 60 to 1200 RPM by the use of V-belts.

MOREY
...for more value!

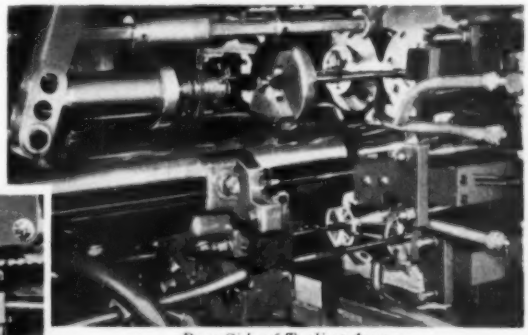
MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
410 BROOME ST. • NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-7460 • CABLE: WOODWORK, N. Y.

Although certain types of shaft jobs offer natural opportunity as bar machine work, with the exception of the CONOMATIC, seldom do they appear on multiple spindle bar automatics. In general, shaft jobs require a longer tooling area than do other types of bar work.

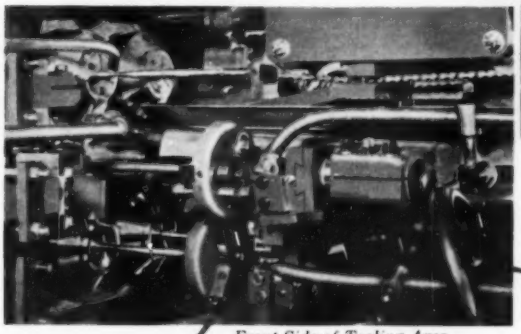
A glance at the frame design of the CONOMATIC explains why its tooling area is longer* than the tooling areas of other "automatics." And there are more tool positions* and more room* for tool setting for *any* type of job.

*You can have the figures

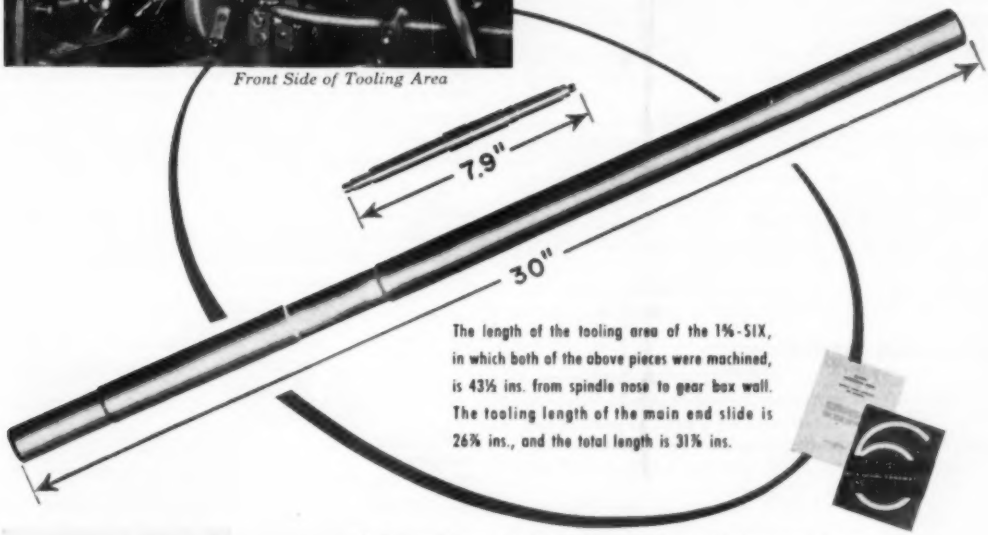
THERE'S *More* THAN JUST *"Elbow Room"*



Rear Side of Tooling Area

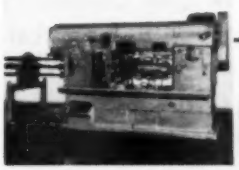


Front Side of Tooling Area



The length of the tooling area of the 1⅝-SIX, in which both of the above pieces were machined, is 43½ ins. from spindle nose to gear box wall. The tooling length of the main end slide is 26⅜ ins., and the total length is 31⅞ ins.

A Comparison of ALL Automatics is in favor of Cone



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

Versatile

IS THE WORD FOR CLEVELAND MODEL B AUTOMATICS

Ask the shops that run them—they'll tell you that this Cleveland is one of the most versatile and practical of all machine tools! The Cleveland Model B takes on an unusually broad range of work and requires but simple tooling. Feed and speed range permit working a variety of materials—from free machining metals to tough, high carbon steels—with carbides.

Tooling is mounted on a long milling slide capable of turning several OD in one operation (plus one end-working operation), and on two independent cross slides where forming and additional turning can be performed. An independent cut-off attachment and swinging gauge stop are provided to free the cross slides and milling slide for other operations. A cross slide turning attachment is available for turning work that cannot be formed.

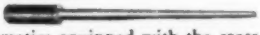
NEED LONG SPINDLES, RODS, BOLTS, SHAFTS, ETC.?

The 2½" Cleveland Model B works pieces up to 18" in length. The photograph with the accompanying tooling diagram shows a typical job.

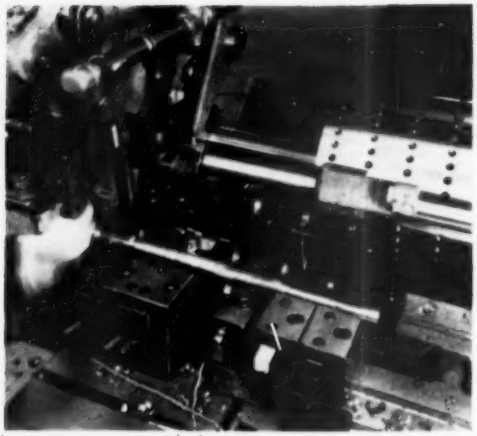
SHORT PARTS, TOO?

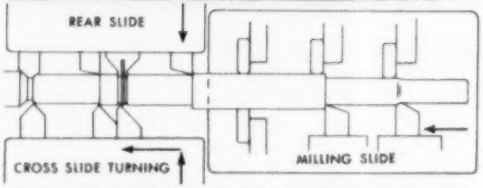
You can produce a broad range of short length parts requiring multiple OD's and shoulders with the 2½" machine, as well as with the 1-1/16" Model B, which works pieces up to 8" in length. Hex nut, tap and drill blanks, studs, bearing races, bushings, pins, rolls—a multitude of parts used in large quantities throughout industry are quickly and economically produced.

HOW ABOUT TAPER TURNING?



Cleveland Model B Automatics equipped with the cross slide turning attachment can turn work of various degrees of taper. Producing mandrels, taper pins and similar parts is "just another job" for the Cleveland Model B.



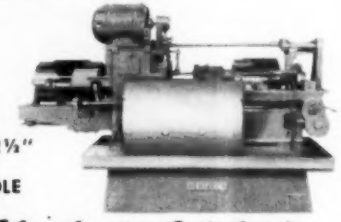


13-13/16" shaft of 1-1/16" S.A.E. 1020 C.R. steel produced at rate of 43 pieces per hour on 2½" Cleveland Model B Automatic. Diagram shows how carbide tools are set-up to produce the part.

SECOND OPERATION WORK?

In addition to performing first operation work on parts from bar stock, Cleveland Model B's can be equipped with magazines for automatically loading these parts for second operation work. You'll get fast production on such jobs as threading studs, pipe nipples, and working other pieces requiring first and second operations.

Talk about versatility—the Cleveland Model B is practically a machine shop in itself. Call in a Cleveland Sales Engineer—let him show you how profitably the Cleveland Model B can work on your production. For machine specifications, write for Bulletin "B."



CLEVELAND 2½" MODEL B SINGLE SPINDLE AUTOMATIC

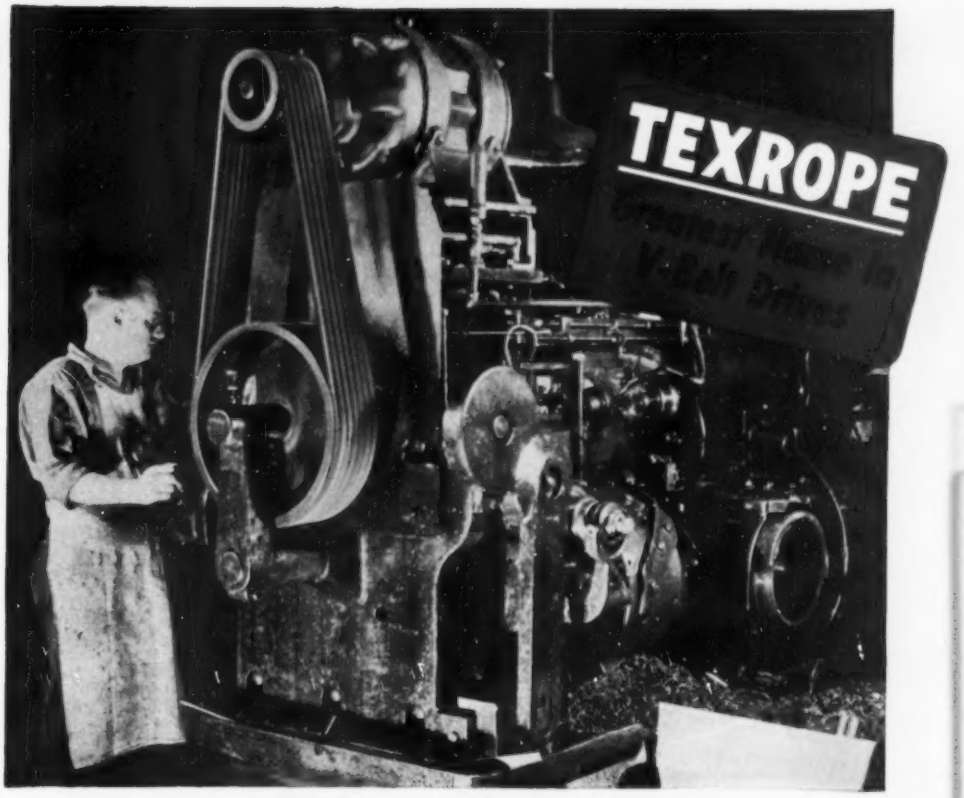
Remember *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

Manufacturers of a Complete Line of Single Spindle Automatic Screw Machines and High Pressure Hydraulic Die Casting Machines



Check These 2 Ways to Cut Drive Costs

TEXROPE V-Belt Drives with low cost 1800 rpm motors will often do work of expensive motors and control.

For example you can:

1. Provide slow speed (such as 450 rpm) at the driven shaft using a standard 1800 rpm motor. A standard 4 to 1 *Texrope* drive will do it. And the savings over a 450 rpm cage motor, direct connected are:
   - 600 pounds weight (in 15 hp size).
   - About $200 in cost.
   - About 8% increase in efficiency.
2. Use *Vari-Pitch* sheaves on a *Texrope* drive and provide smooth, stepless speed adjustment. There's no need for a high cost special motor or electric control to provide up to 2 to 1 speed range.

For help on your drive problem, whatever it may be, call your nearby Allis-Chalmers distributor or district office, or write Allis-Chalmers, Milwaukee 1, Wis.
A-3734

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Distributors, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types

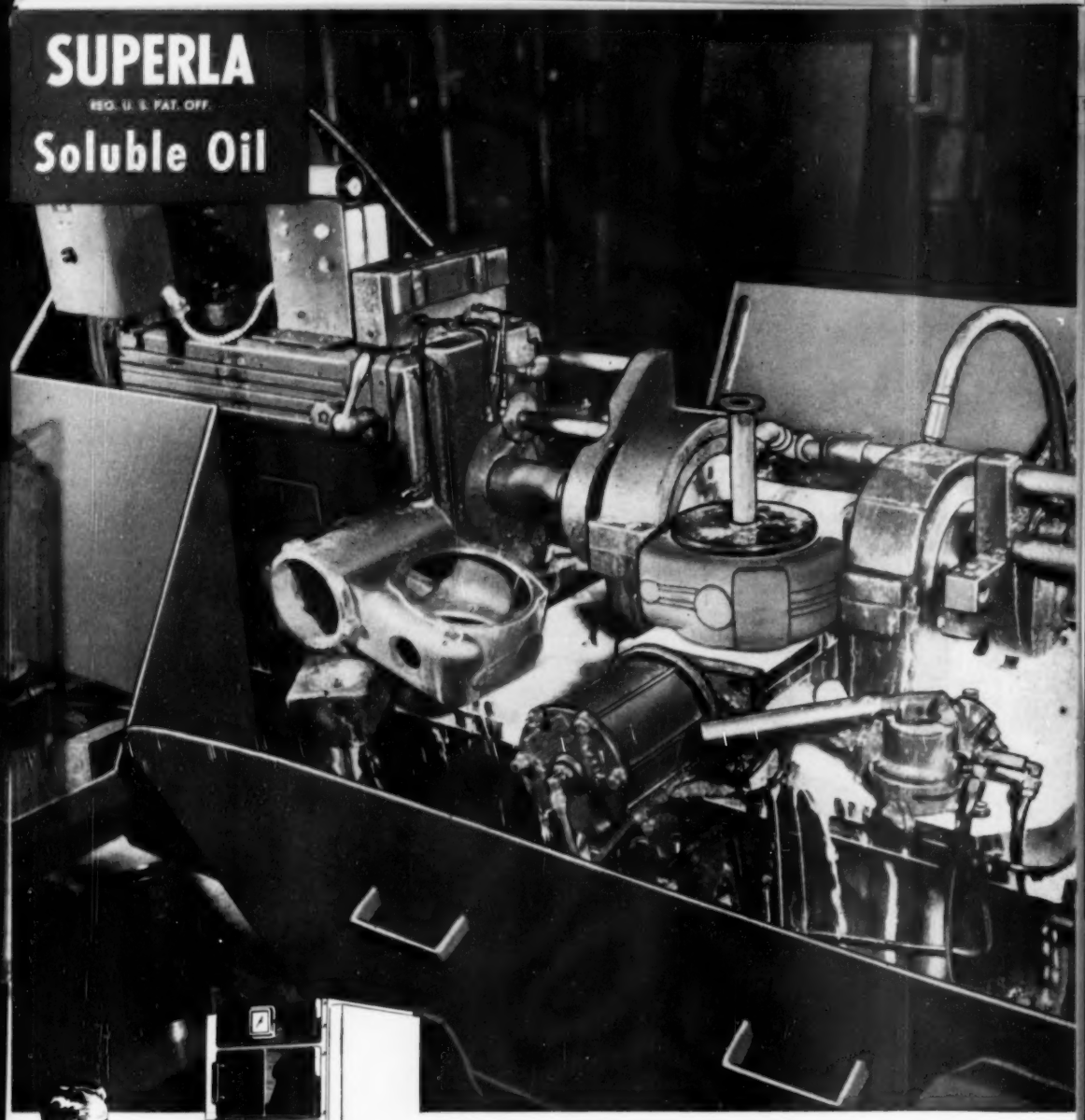
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

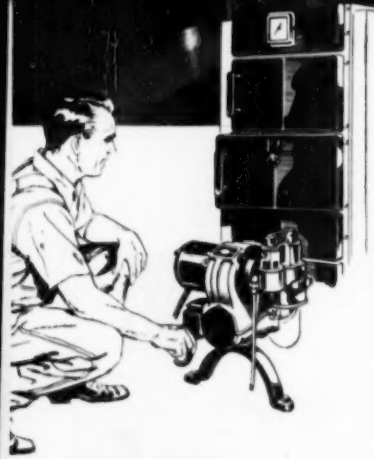
PUMPS — Integral motor and coupled types from ⅜ in. to 72 in. discharge and up.

SUPERLA

REG. U. S. PAT. OFF.

Soluble Oil





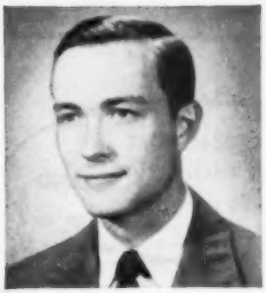
Solution for a hard water problem.

"With the hard water we have at this plant, SUPERLA Soluble Oil works best of all products tried," reports Carl J. Winkler, president of U. S. Machine Corporation, Lebanon, Indiana. The company, manufacturing Winkler heating equipment, has used SUPERLA for 15 years. During this period, other coolants have been tried, but none has given the results obtained with SUPERLA Soluble Oil.

Boring of the cast iron main housing for a Winkler oil burner is illustrated above. With SUPERLA Soluble Oil, the life of carbide tools has proved excellent. There has been no spoilage of the work due to rusting. Moreover, clean operation and freedom from odor development with SUPERLA have provided desirable working conditions for machine operators.

To help select the right coolant or cutting oil for your own machine tool operations, call for the services of a Standard Oil lubrication specialist. Contact your nearby Standard Oil Company office.

What's YOUR problem?



Meet Wesley L. Tharp, lubrication specialist with headquarters at Standard Oil's Indianapolis office. U. S. Machine Corporation is one of the manufacturing companies he contacts regularly in order to help keep production running smoothly.

Like all Standard Oil lubrication specialists, Wesley Tharp has a good background of experience plus thorough training in Standard's own schools. And like all specialists, his on-the-job assistance is always available to the industries in the area he serves. He is one of a corps of experienced men who make their headquarters wherever industry is located throughout the Midwest.

Put a Standard Oil lubrication specialist to work on your problem.

STANDARD

STANDARD OIL COMPANY

(INDIANA)

STANOSTAMP

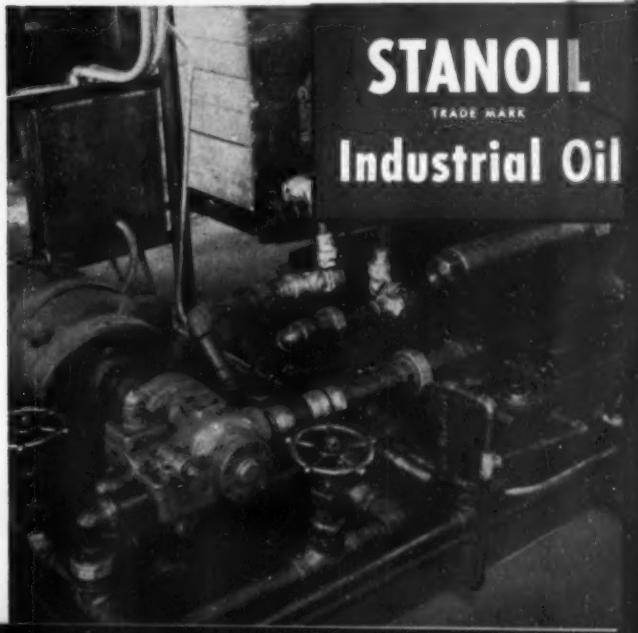
REG. U. S. PAT. OFF.

Compounds

PUT MORE PUNCH INTO PRODUCTION with STANOSTAMP Compounds. Consider the case of this manufacturer of automotive components who boosted production from 10,000 piece parts to as many as 100,000 before dies required polishing. This was the result of switching from an oil base compound to STANOSTAMP Compound "C".

For maximum protection for both dies and work in your own pressroom, ask your Standard Oil lubrication specialist about STANOSTAMP. Three grades are available to cover a wide range of stamping and heavy drawing work on low carbon or alloy steel.

FIVE YEARS, NO CHANGE OF OIL. That's the record to date for the STANOIL Industrial Oil serving the hydraulic unit shown below. After five years of service the oil is in near-perfect condition. There is no deposit and no varnish in the hydraulic system. There has been no need to clean the system. For comparable trouble-free performance in your own hydraulic units, or for lubrication of speed reducers, head stock gears, auxiliary turbines, and compressors, call your local Standard Oil office. Or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.



STANOIL

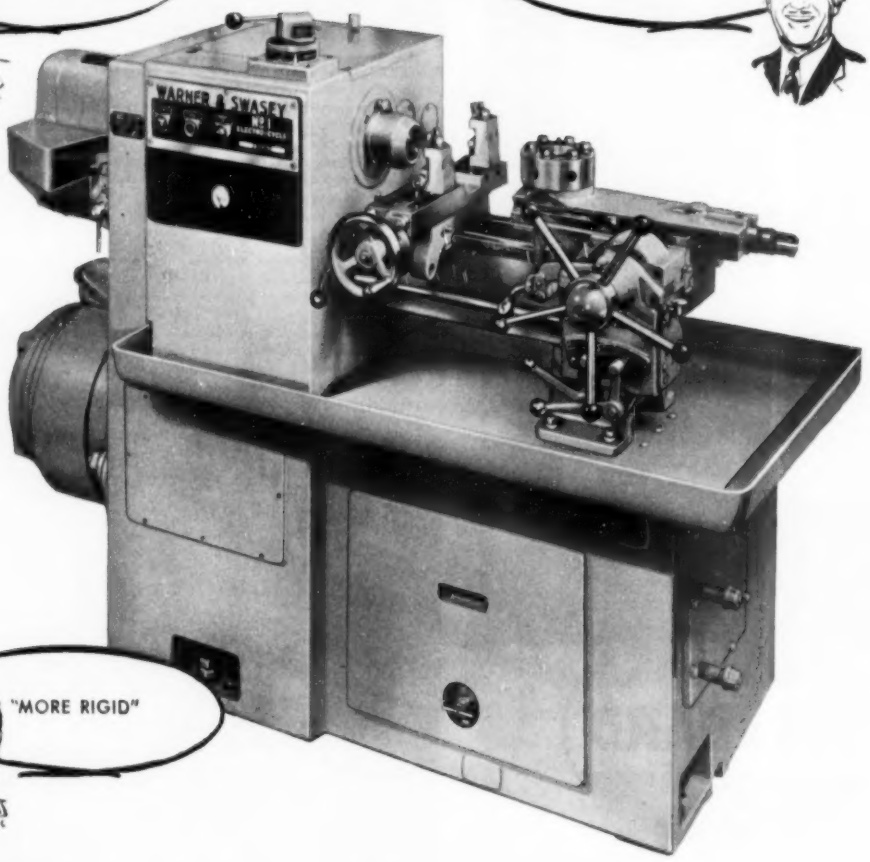
TRADE MARK

Industrial Oil

NEW WARNER &

"MORE EFFICIENT ON STAINLESS STEEL"

"A GREAT DEAL MORE FLEXIBLE THAN PREVIOUS MACHINES OF ITS SIZE"



"MORE RIGID"

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER

SWASEY TURRET LATHE

wins fast acceptance!

SINCE ITS INTRODUCTION IN 1950, the Warner & Swasey No. 1 E-C has lived up to the reputation for accuracy and dependability already set by its "big brothers" in the Warner & Swasey line.

Reports keep coming in from such leading metal-working plants as Dumore Company of Racine, Allmetal Screw Products of New York City, Bahnson Company of Winston-Salem, Wisconsin Motor Corp. of Milwaukee and Kearfott Manufacturing of Newark.

And many others tell us the 1 E-C is outperforming any small capacity turret lathe they've ever had in their plants! You too, will find it profitable to investigate the Warner & Swasey No. 1 E-C Turret Lathe, by having your Warner & Swasey Field Engineer show you how it can improve your small diameter bar operations.

WARNER & SWASEY
Cleveland

& SWASEY TURRET LATHES, AUTOMATICS, AND TAPPING MACHINES

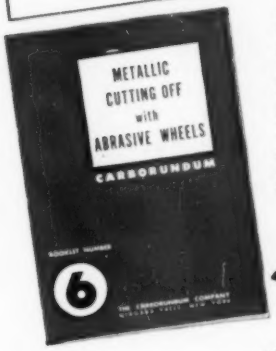
Metallic Cutting

Only CARBO

TRADE

"Carborundum", "Aloxite" and "MX" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N. Y.

Off...



Abrasive Cutting Off Wheels by CARBORUNDUM are from 12 to 20 times faster than steel saws, on all kinds of metals—produce smoother, more finished, better quality cuts than you can get with flame cutting or shearing—and they do the job at lower overall cost than conventional methods. Rubber bond wheels as thin as five thousandths—resinoid bond wheels as thin as $\frac{1}{32}$"—"MX" wheels as thin as $\frac{3}{32}$"—there is a wheel by CARBORUNDUM for every high speed production operation in your shop.

ORDER FROM YOUR CARBORUNDUM DISTRIBUTOR TODAY. He's your best bet for complete stocks, prompt delivery, experienced counsel on latest developments in the field. You'll find him listed in the yellow pages under "Abrasives." Phone him today—it's to your profit!

This "tell-all" booklet is FREE!

THE CARBORUNDUM COMPANY, Dept. AM 81-82
Niagara Falls, New York

Please send me, FREE, your booklet No. 6, "Metallic Cutting Off with Abrasive Wheels."

NAME AND TITLE

COMPANY

STREET AND NUMBER

CITY ZONE STATE

RUNDUM
MARK

offers ALL abrasive products...to give you the proper ONE

Keep Your on the OLIVER Line
— Cost Cutting
Production Boosting
MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers with each lip doing equal work, give tailormed cuts—more accuracy—more perfect holes!—more efficiency—longer drill life.

As Illustrated:

No 21 Oliver Bench Drill Grinder. Hand operated for Drills No 57 to ½

No 510 For Drills ⅛ to 3 —2-3-4 flute

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model 5-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten Carbide work. Direct reading for clearances reduces fatigue — eases operators jobs.

The ACE excels for grinding face mills up to 15" also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard

OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1½" wide x 1¾" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high speed tools. offers increased production, lower tool costs and savings in man hours. Extremely fine finish assured.

Write Today for Complete Information

OLIVER INSTRUMENT CO.

SALES & MANUFACTURING ADRIAN, MICHIGAN

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Social Security — and Liars

AMERICAN MACHINIST for April 14 published an insert reporting a survey on the ideas on retirement of pensioners. You reported the findings of the survey to include the following:

"Social Security Makes Liars of Us All.

"Hale and hearty pensioners condemn Social Security restrictions which prohibit payments to retired men who work. The survey showed a sizable number work full time . . . but conceal the fact. One in seven of the 59% who said they spend more than income admitted working . . . "

I was of course very much concerned at this report, since it has not been our experience in the administration of the retirement test under our program to find more than a very occasional isolated reaction of this kind. Moreover, this is not a general criticism coming from other sources.

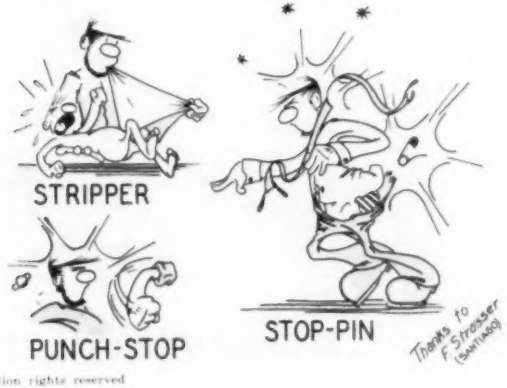
I am glad to report that the manager of our Cleveland field office found in a discussion with Messrs. Stanley L. Payne and Frank J. Chokel of Special Surveys, the organization that made the survey, that the statement in the news release represents an inaccurate interpretation of the findings. Only one of the retired workers interviewed stated that he felt that, "These unfair government rules are making liars of us all" (They Tell About Retirement, p. 28). The full quote from this special survey of retired men in Cleveland is:

"The men who have been working are about equally divided in their motives, 30% say they work because they need the money, 29% say they do it because they like to work, and 36% say both reasons enter in. (No opinion, 5%.) One reservation about the fullness of reporting of outside jobs should be mentioned here. Under present regulations a pensioner who earns more than $50 in covered employment in any month forfeits that month's social security payment. In a few cases interviewers received the impression that outside work was hidden from them. For example, one man who did not admit to having a job did volunteer that 'these unfair government rules are making liars of us all.' We believe that this covering up occurred only infrequently, and do not sense similar reticence in answers to other questions."

My protest on this one interpretation does not diminish my appreciation for the thoughtful contributions which the AMERICAN MACHINIST and other McGraw-Hill periodicals have

GRINETICS

BY D. G. SMITH

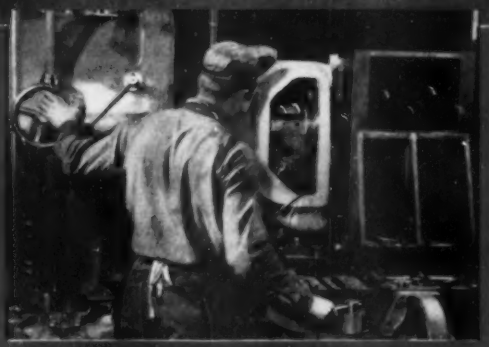


Republication rights reserved

Only Lucas CAN MAKE A LUCAS

...but others are lending a hand

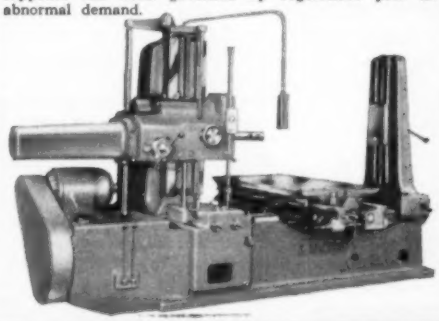
This is one of America's outstanding plants of its kind, and every tool in it is there for the production of Lucas Horizontal Boring, Drilling and Milling machines. This specialization means a greater output of critically needed machines for the defense program.



Thousands of man hours of machine experience on Lucas mills enable us to keep quality abreast of quantity.

Many an outside supplier is working 'round the clock on component parts to supplement our own efforts. Final assembly and inspection is still carried on in our own plant.

We still have to keep many a loyal customer waiting, because our output like that of all other defense machine suppliers has been governed by regulations plus an abnormal demand.



Your inquiry and your order are still as welcome as ever. When you do get the Lucas you need you'll find it your No. 1 money maker – the most used machine in the shop.

THE NEW BRITAIN MACHINE COMPANY — LUCAS

LUCAS

Precision

HORIZONTAL BORING, DRILLING AND MILLING MACHINES
LUCAS MACHINE DIVISION, THE NEW BRITAIN MACHINE CO.
CLEVELAND 8, OHIO

You get *MORE* than just steel

Personalized service is the big "plus" you get when you come to us for your warehouse steel requirements.

Warehouse steel is a bargain for you when you take full advantage of the "no extra charge" service United States Steel Supply's team of technical and service experts will give you.

Full information on available steel supplies . . . current prices . . . latest in production techniques . . . machinery and shop supplies . . . will be brought to you *personally* by the United States Steel Supply salesman, who regards your needs as his personal responsibility.

Get more than just steel

by calling your source of personalized steel service . . .

UNITED STATES STEEL SUPPLY DIVISION
UNITED STATES STEEL COMPANY

HEADQUARTERS: 208 So. LA SALLE ST., CHICAGO 4, ILL. · WAREHOUSES COAST-TO-COAST
BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE · MOLINE, ILL. · NEWARK
PITTSBURGH · PORTLAND, ORE. · ST. LOUIS · TWIN CITY (ST. PAUL) · SAN FRANCISCO · SEATTLE
Sales Offices: INDIANAPOLIS · KANSAS CITY, MO. · PHILADELPHIA · PHOENIX
ROCKFORD, ILL. · SALT LAKE CITY · SOUTH BEND · TOLEDO · TULSA · YOUNGSTOWN

UNITED STATES STEEL

made to an understanding of problems of retirement. If we can be of help to you in future discussions, we would welcome the opportunity.

OC Pogge, Director
Bureau of Old-Age & Survivors Insurance, Federal Security Agency, Baltimore, Md

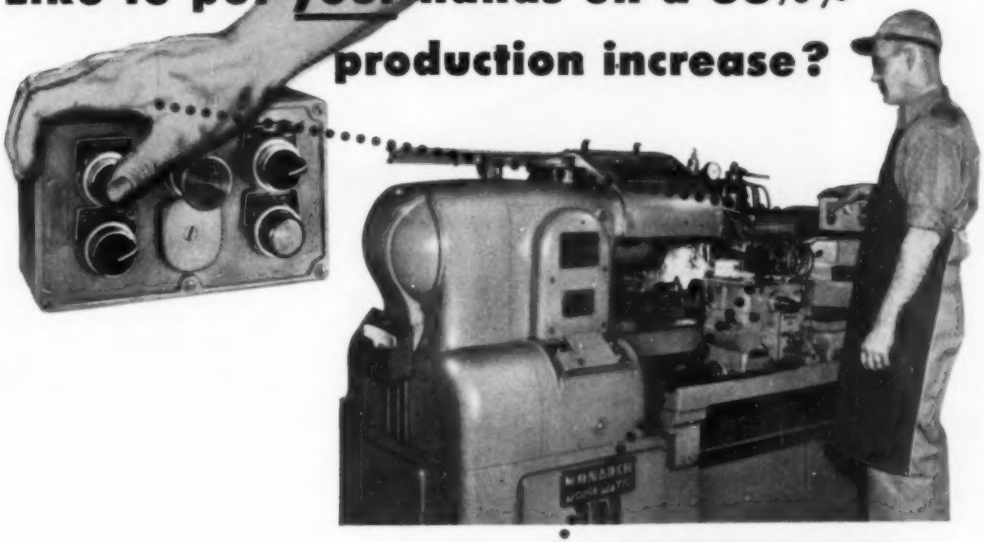
In our informal—and limited—discussions with retired men, we have found that they resent the restriction regarding work. As Mr Pogge's letter states, present regulations make it impossible for a pensioner to earn (as wages) more than $50 or he forfeits his security payment. The latter amounts to $80 a month for a single man, or $120 for man and wife (both over 65). Under present conditions, such an income is in many cases insufficient, so the working man without pension or income from investments cannot afford to retire. The shopman, who usually has no investments and little or no pension, is penalized; while the executive, who usually has both investments and a sizable pension, is not. Yet both have paid the same amount to the same fund. Congress is currently considering a bill to permit an outside income up to $100 a month—or twice the present limit. This is still too small; it leads to evasions and subterfuges, and is downright bad for the man who feels fit to work. He must either loaf —and die from boredom—or work hard to make enough to compensate for the $80 or $120 loss of Social Security. This is like life insurance —which a man must die to beat—Ed.

Little Wheels

We have been watching with great interest several articles and comments you have had in AMERICAN MACHINIST on grinding holes in miniature bearings.

In 1926 we exhibited the world's smallest grinding wheel, designed for commercially grinding holes 1/16 in. in dia. Thus it will be seen that small-hole grinding is not exactly new. Indeed, we have been making miniature mounted wheels for over

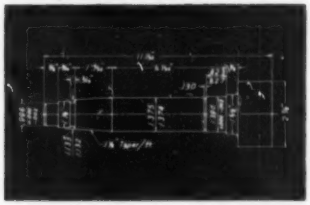
Like to put your hands on a 33⅓% production increase?



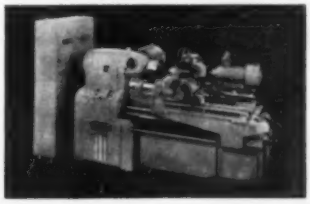
Since the Milwaukee Gear Company installed their first completely automatic cycle Monarch Mona-Matic several years ago, an *overall* turning production increase of 33⅓% has been recorded.

An interesting point is that this machine is used for a large variety of work in relatively small lots—proving again that for accuracy, for rate of output and for ease and speed of setup, the "Air-Gage Tracer" controlled Monarch Mona-Matic just can't be equaled. Now, a second Mona-Matic has been installed by this user. On many jobs, one man can operate both machines, practically doubling the original increases.

Even greater time reductions are recorded here on specific jobs (see details, right). Results like these are typical of all Mona-Matic installations, whether the runs are short or long. The proved efficiency and economy of the Monarch tracer controlled running tool deserves your serious consideration. So let us give you the complete Mona-Matic story. Write for illustrated booklet No. 1804 . . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



Part—pinion. **Material**—SAE 4615. **Operation**—turn (both rough and finish) from 2⅞" bar stock, using three cuts because of amount of metal which has to be removed. Rear slide tools simultaneously form two necks. **Production Increase**—60% for a run of 320 pieces. This includes setup time and is secured on a *single* Mona-Matic. Because of superior Mona-Matic accuracy, subsequent grinding time is materially reduced.



Monarch
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen: I am interested in your Mona-Matic story and would like to receive your illustrated Booklet, with complete data and job performance reports. Please send me your Booklet 1804 without obligation.

NAME _____ TITLE _____

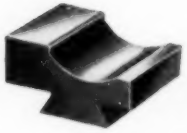
COMPANY _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

TURN PROBLEMS INTO PROFITS

with Gorham-ENGINEERED SPECIAL CUTTING TOOLS



Next time you're up against a tough tooling problem, call in the man who can give you *the right answers fast* . . . your nearby Gorham Field Engineer! He's an expert in special cutting tools . . . and he's ready to provide a complete engineering service to determine your exact tooling requirements. He starts with your product, sketch or idea. He surveys your production operations and available equipment. He considers work material properties and desired finishes and tolerances. He plots proper machine feed, speed and method of tool driving. Then he develops practical design and engineering specifications for special cutting tools, metallurgically "tailor-made" for your application.

His recommendations are backed by Gorham's unmatched facilities, which include three fully-equipped modern plants, a large Engineering and Metallurgical staff, and a force of field application engineers in principal industrial centers, coast-to-coast. All are dedicated to furnishing prompt and profitable solutions to your special tooling problems. Gorham-engineered "specials" are turning problems into profits in thousands of plants every day . . . why not let them do the same for *you?* If you haven't met your nearby Gorham Field Engineer, write for his name, or send details of your problem direct for recommendations.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14408 WOODROW WILSON • DETROIT 3, MICHIGAN

40 yr, and always to a very high degree of precision. We can manufacture commercially 1/16-in. grinding wheels in any required quantity. Usage is not large, but has been consistent over the years.

Your comment in Talking Shop (*AM*—May 26 '52 p133) prompts this.

A T Dalton
Sales Manager
Chicago Wheel & Mfg Co
Chicago, Ill.

The Talking Shop item actually refers to an article, (AM—March 3 '52 p143) describing the particular problem. The difficulty lies in the fact that the steel is hardened to 63 R_c, and bearings must be made to almost unbelievably close tolerances. Slightly larger sizes cause no trouble, but these small bores kick up all over the place. The original story will explain the situation.—Ed.

Gun Drills

In reference to your recent article, "How Modern Gun Drilling Improves Hole Making" (*AM* May 26 '52 p109) I note that the author mentions the two principal companies doing this type of work are Pratt & Whitney and W F & John Barnes.

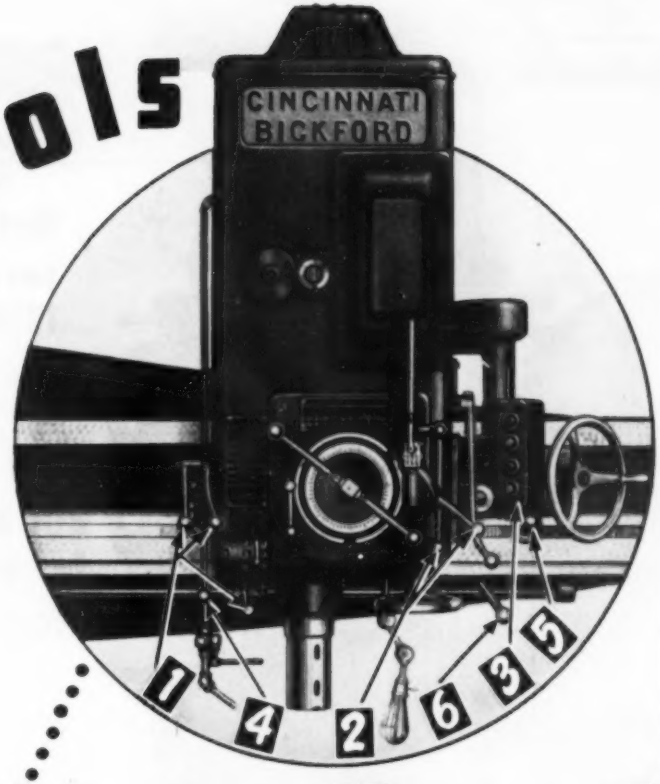
I am enclosing three of our circulars to show that we have been in this deep-hole and gun drilling for quite some time, and thought they might be of interest to you.

Richard R. Brangan
National Automatic Tool Co, Inc.
Richmond, Ind

Report was not a general industry roundup on deep-hole drilling, as so many of our Special Reports are. Rather, it was a roundup of ideas from a small group of manufacturers who have made tremendous strides in gun-drill application. They suggested the two companies named.

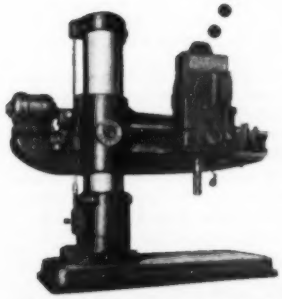
Machines shown in the Natco catalogs have all the characteristics for efficient deep-hole drilling, using single-lip, pressure-lubricated gun drills in the modern sense.—Ed.

Fewer Controls



1. 3 levers control 36 spindle speeds.
2. 2 levers control 18 feeds (sliding gears)
3. One convenient panel for driving motor control, column clamping and unclamping control.
4. One directional lever, controls — arm elevating, lowering, clamping and unclamping, also automatic pressure lubrication of column.
5. Power rapid traverse of the head in either direction by single lever.
6. Speed clutch control—spindle start, stop and reverse by one lever.

and all at the Head



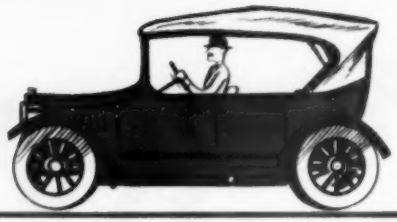
Equal Efficiency of Every Unit Makes the Balanced Machine

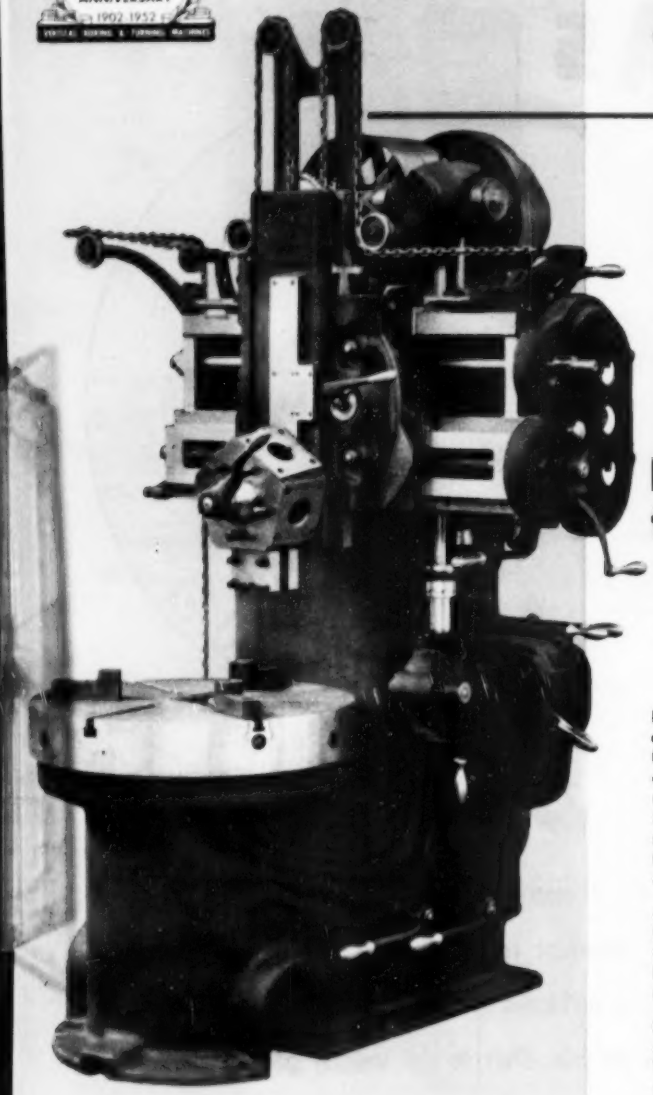
Controls are all centralized low at the head within easy reach. Operator movement required to use the Super Service Radial efficiently is performed in the shortest possible distance, with the least possible effort in the shortest possible time. For further information on the many other patented exclusive features of the Super Service Radial, write for Booklet R-29.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

KING
50th ANNIVERSARY
1902 1952





Get prompt repair service for this 1919 "Gas Buggy"?

Impossible!

But NOT IMPOSSIBLE for this 1919 KING

Here's a typical example of KING long life, and what KING customer service can mean. Recently we received a phone call from one of our fine customers in Akron, Ohio, telling us of a breakdown on their 42" KING—Serial Number 1801. A new operating nut, shaft and sleeve were urgently needed to get this KING back in service. Anything we could do to help would be greatly appreciated.

A quick check of our records told us that this KING was delivered in 1919! *Thirty-three* years in service! Yet we called this customer back the same day, and reported that the needed parts would be shipped in 96 hours!

If defense-rated orders are keeping you from obtaining the new KING Vertical Boring and Turning Machines you need, let us help you maintain your production schedules by keeping your old KINGS in good condition. There are many KING Mills in service, dating back to 1906, for which we still supply repair parts. Can we help you service your KINGS?

New Series KING Vertical Boring & Turning Machines are available in ten sizes—30", 36", 42", 52", 62", 72", 84", 100", 120", and 144".

American Steel Foundries

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

SPOT NEWS of Metalworking

- **Second nuclear-powered submarine will be built for the Navy,** the hull by Electric Boat and the engine by General Electric. First atomic submarine also is being constructed by Electric Boat, but power plant is joint development by Westinghouse and Atomic Energy Commission.

- **Ford has begun work on $2.5 million contract** for designing, developing, constructing, and testing ¼-ton experimental vehicles for army Ordnance Corps. Unit will be new from ground up. One of features will be improvement in power-to-weight ratio. Delivery of prototype vehicles will be made in 24 months. New vehicle is called the M-151.

- **Pulse jet engine with useful life of 200 hr has been developed by Naval Research Laboratory.** Probable aircraft application: Rotor power on helicopters. Engine is relatively new type without pistons, fly-wheels, or wall-defined combustion space. It produces static thrust several times as great as its own weight, can burn any liquid fuel, requires no lubrication or cooling system.

New German aviation company, Junkers Plane & Motor Works, has been founded in Kassel, Germany, to develop, manufacture, repair, and sell planes, motors, parts, and machine tools for aviation production. Kurt Adenauer, nephew of Germany's chancellor, is one of two business managers of the company. Plant will be at Lohfelden, near Kassel.

- **Navy's 1953 shipbuilding program calls for construction of 38 new ships,** plus a second super-carrier and second atomic submarine, and 350 landing craft. Construction contracts will be let to private yards on a negotiated-award basis, except for conversion of two Essex-class carriers which will be handled by West Coast naval shipyards.

- **Threats of big strike in copper mines and smelters is more serious than ever.** Practically all copper workers are on the job without a contract. Serious collective bargaining is beginning, now that the steel strike is over. Meanwhile brass mills, wire mills and foundries have taken their full July quotas of high-priced foreign refined copper.

About 80-90% of machine tools required by automobile makers for new models are reported to be outside the critical list of machine tools reserved for defense contractors and hence can be supplied by machine tool builders under amendment to NPA Order M-41 allowing shipment of unrated orders. For complete story, turn to p 141.

- **Reward of $10,000 for information leading to conviction of anyone threatening an employee** who goes to work during its current strike is being offered by Timken Roller Bearing Co., whose plants at Canton, Columbus, and Zanesville, Ohio, were struck on July 19. Management and labor are deadlocked on union-shop issue.

- **To broaden the mobilization base in case of war,** DPA has set as its goal an increase in plant facilities over pre-Korean days in the following amounts: Machine-tool industry $125 million by January 1, 1954; press and forge industries $28 million by same date; metal-cutting-tool industry $30 million by July 1, 1953; tool-and-die industry $33 million by January 1, 1954; and abrasive-products industry $34 million by July 1, 1953.

- **Protective coatings for molybdenum composed of chromium and frit** extend greatly the useful life of this metal at jet-engine temperatures, National Bureau of Standards studies show. At temperatures of 1500-1800 F the coated specimens lasted for 1000-3000 hr. Most durable coatings resulted from application of a glass-free chromium base coat followed by a glass seal coat.

CONTINENTAL Makes Both to Suit Your Requirements

The form-relieved milling cutter at the left above has a ground form, while the cutter below has an unground form. Both are easily sharpened by grinding the faces of the teeth.

If limits are within plus or minus .001", if the form has several angles or radii, or if the job requires a fine surface finish, then we recommend the ground form. The grinding operation corrects any distortion caused by heat-treatment, insuring an accurate form and a true-running cutter for a good work finish. However, if tolerances are not too close and the form is not too intricate, you can save money by using unground form-relief cutters.

Continental, being a division of Ex-Cell-O, supplies the tools used by Ex-Cell-O for the volume production of precision parts for aircraft and other industries. This work provides an exceptional opportunity to try out various tool designs and materials and to determine definitely the best tools for today's production needs.

These facts can mean real savings to you. Call in your Ex-Cell-O representative or contact Continental in Detroit today for information on Production-Proved Cutting Tools.

In this group of special Continental tools are ground and unground form-relieved cutters, flat form tools, an offset carbide tipped tool and a double-end carbide tipped spot-facer.

Continental
TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN

52-16

Washington

Civilian control of military buying is the real issue in the latest squabble between the Pentagon brass and Defense Production Administration.

• • •

DPA started the fight with a scathing report on Air Force-Navy procurement of combat aircraft. This critique was presented behind closed doors of the Aircraft Production Board, made up of top military, civilian defense men.

Air Force, Navy were flabbergasted. It was the first real challenge to military buying policy and practice since World War II.

• • •

But the row was long brewing. Ever since last December—time of the "stretch-out"—a number of civilian defense experts have been upset over aircraft output. They accused the services, particularly the Air Force, of poor production scheduling, blaming the stretch-out—a White House cut in their own budget estimates—for delaying arms output.

Charles E Wilson averted a showdown as long as he was defense-mobilization boss. His theory: You can get more out of the military by persuasion than by fighting. DPA Chief Fowler doesn't share that view.

• • •

Fowler is on safe ground in chiding the services for snarling production with red tape. Most of Washington knows the Pentagon has antiquated procedures for letting contracts, inspecting and accepting new weapons, getting arms and equipment in the order they are really needed.

But DPA blundered when it urged switches in virtually all contracts for fighters, bombers, and engines to power them. The proposed shifts backed up DPA's contention that services are building too many planes for a specific job. Instead, DPA feels, production should be concentrated on the best existing fighter, interceptor, light bomber and so on.

• • •

This gave services a target to shoot at when they report back to APB August sixth. They'll say such widespread changing of contracts boils down to freezing of designs—the very mistake that cost Hitler a war.

Actually, Fowler has no such intent. He wants to cut production of obsolete planes—like the Navy's piston-engine attack bombers, all Air Force fighters inferior to the F-86-F Sabre, for example. But he would speed up the best planes now in production.

But DPA's report went farther, urged that developmental work on new planes — like Navy's Grumman F-10-F, Air Force's Republic F-84-G — be dropped. Instead, the report holds, research and development should be put on better planes. Some of these proposals sound good even to Air Force men and plane manufacturers. But, coming from non-flying DPA, it smacks of the sightless leading the blind.

• • •

Upshot probably will be some boost in aircraft production, however. For the moment, at least, Fowler appears to have both White House and Congressional backing. And the record on aircraft output won't bear much probing. But don't look for sweeping shift in contracts.

And DPA will have tougher sledding when it tackles the services on production of electronics equipment, other arms and equipment. Bottlenecks are due largely to materials shortages.

• • •

Aluminum from Canada has come up again. This time anti-monopoly Congressman Celler, who heads the House judiciary committee, is goading DPA to make a long-term purchase deal with Aluminum Co. of Canada. He isn't likely to get far. More potent Congressional forces are against the proposal.

• • •

Army is next small-business target. Small Defense Plants Administration has just made agreement with Navy similar to earlier accord with Air Force. Each permits SDPA representatives to sit in with procurement officers in regional offices to have a say on contracts.

• • •

Washington will only go though the motions of wage and salary control until the June 30 expiration. Enforcement action will be lax, too.

Congress put some more holes in the wage lid by exempting small business, wages under $1 an hour, farm workers and professional engineers, architects and accountants. Then it slashed stabilization-agency funds almost in half.

One of the first new policies to come out of the new Wage Stabilization Board will be some device for permitting productivity increases.

• • •

Metalworking plants are involved in some key decisions coming out of the National Labor Relations Board on relations between workers and their unions. This is what NLRB ruled at:

Food Machinery & Chemical Corp: A union may have a reinstatement fee higher than the original initiation fee, just so it is not "excessive."

Bendix Aviation Corp: A union may not charge a higher initiation fee to employees who exercise their right not to join the union before it has a legal union-shop contract.

International Harvester: A union may not have non-union employees fired for "anti-union activity" where it appears to be a pressure move to get them into the union.

WHO IS RESPONSIBLE

for the machine-tools in your shop?

- **The dealer who sold them?**
- **The Engineering Company that designed them?**
- **The factory that built the machine, tool, or fixture?**

Where can you get complete service and satisfaction?

With users of Microhoning equipment there is no possibility of divided responsibility. One organization sells, engineers, builds, and services the complete installation. Micromatic is proud to assume full responsibility for all equipment and the results obtained with the Microhoning process.

As the leader in the development of the honing process, Micromatic offers a complete line of equipment for processing all types and sizes of cylindrical and flat surfaces.

If your problem is production, precision, or costs let our organization of experienced engineers help you.

MICRO MATIC
TRADE MARK

MICROHONING MACHINES

Write for issue of CROSS HATCH describing MICROHONING MACHINES

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

MICROMATIC HONE CORPORATION • **8100 Schoolcraft, Detroit 4, Michigan**

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
Boston Post Road
Guilford, Connecticut

MICROMATIC HONE CORP.
614 Empire Building
26 So. Main Street
Rockford, Illinois

MICROMATIC HONE CORP.
1323 S. Santa Fe Avenue
Los Angeles 21, California

MICROMATIC HONE LTD.
55 George Street
Brantford, Ontario, Canada

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

REPRESENTATIVES: Overgard Machine Tool Company, 234 Commonwealth Bldg., Denver 2, Colorado
Hallidie Machinery Co., 2726 First Ave., South, Seattle, Wash. • REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES

Detroit

The steel strike had Detroit in deepest gloom. Passenger-car plants were all down during the latter part of July. But that is not the worst of it. Washington is telling the car companies that the effects of the strike will be so bad in the fourth quarter that allocations may be shaved to nearly half of their originally projected level of 1,150,000 vehicles. That's bad news indeed for the car makers, the worst blow they've had since Pearl Harbor brought output curtailments at the start of 1942.

The effects will linger beyond that, too. The way auto companies hear it, there is not enough ore in prospect for the rest of the shipping season to keep the mills going next spring before the 1953 navigation season opens.

Beyond that, there is a great scramble for ore going on; the shortage on the lower lakes has everyone moving in every area, so normal patterns of distribution may be somewhat upset.

Ford, meanwhile, has a special problem. Its small mill kept operating during the steel strike, and was allocated military tonnage. Those allocations will go on through the rest of the summer. As a result, its capacity for its own requirements has been considerably impaired. So it is out in the open market trying to buy steel that it formerly built itself.

Look for conversion steel again, plenty of it. Many automobile companies have been closing conversion deals extending many months ahead, although it was only three or four months ago that all conversion contracts were wound up and the industry breathed a sigh of relief and figured that phase of its history was behind it forever.

Post-strike-steel facilities are being sought so intensely, however, that conversion contracts appeared to be the best out for many users.

Beyond that, the auto companies are doing a different kind of converting, if transfers of steel from one vendor to another can be called that.

Surveys among vendors proved to the auto companies that their suppliers will need anywhere from a week to almost 90 days to get back in production after the end of the strike. The result was the companies immediately began moves to transfer post-strike tonnage from better-situated suppliers to those in trouble—they had to do this or face the possibility of shutdown until the last single supplier could begin his shipments.

The way it stands now, you will see some preliminary automobile production in two weeks or so. You won't see normal production, however, for six to eight weeks after the July 24 strike-end date. The reason: Pipelines all along the way have largely been drained.

Silliest rumor of the week: That on account of the strike auto companies would discontinue the remnants of their 1952 model runs, shift instead to 1953's.

They won't, of course. In the first place they couldn't absorb the commitments already made and the releases for many phases of 1952 model runs not affected by the strike. Second, they couldn't get their tooling in time to make a 1953 model change-over right now.

The best bet today, once steel begins to flow in adequate quantities, is that production schedules will be advanced as rapidly as possible, seeking to make up the gap thus far in the third quarter. The result will be that new-model introductions may be delayed a bit from their projective scheduled dates, but perhaps not too much.

Organized labor—meaning the CIO United Auto Workers—is scaring the daylights out of Detroit machinery companies. It started at Richard Bros big die shop. After a couple of days of strikes (the demand was for general wage raises, although it was disguised as a demand for random rate adjustments under WSB regulations), die makers were sent in to take out their tool boxes.

In this day of labor scarcity, that move was chilling. Other shops rallied to Richard's aid, refused to hire any of Richard's strikers.

At Cadillac Gage, meanwhile, workers did not officially strike over a grievance involving layoff of a steward, but they did stop work to go to a union meeting—which lasted days and days and days.

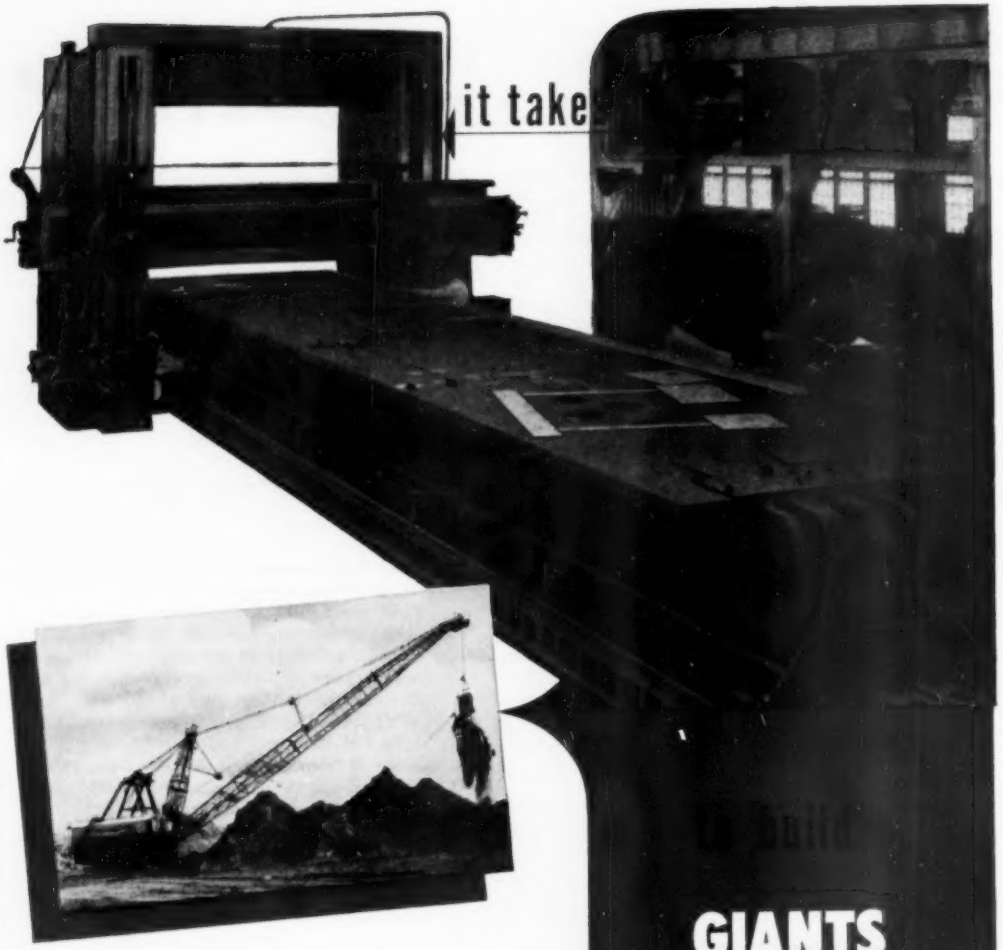
Meanwhile, there were reports elsewhere that the strategy at Richard Bros might be duplicated later on. The hot summer sunshine was not the only thing the die shops had to worry about—particularly with their books fairly well filled with 1953-model requirements.

Increased employment in these shops is keeping pace with the level of incoming orders, making it possible for buyers to get about the same delivery promises as earlier.

In a group of more than 100 representative shops, employment has risen an average almost precisely 5% in the first six months of this year. Yet delivery promises average out about the same—just under seven weeks for stamping dies, jigs, and fixtures, somewhat over five weeks for gages, and about eight weeks for forging dies.

Just for the record, tool-and-die-shop employment in Detroit today is at its highest, it appears, since early 1948. It fell sharply in the wake of a '48 strike, reached bottom in the spring of 1950, and has been pedaling upward since.

it take



GIANTS

MOUNTAINS

Big planers are usually slow planers. But not a GRAY! Bucyrus-Erie found that out when they put a new GRAY 132" x 120" x 50' Heavy Duty Planer to work. This precision GRAY with modern high speeds and operating conveniences is machining a 55' long side section of revolving frame of a Bucyrus-Erie dragline . . . . . a big mouthful in any shop. Again, performance is proving that planer jobs don't grow old on a GRAY.

Write today • get the story on HIGH low cost PRODUCTION

The G.A. GRAY Co

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD I

Machine Tools

NPA Administrator Henry H. Fowler finally signed on July 22 the amendment to M-41 permitting shipment of unrated machine tool orders.

A list of critical machine tools reserved for defense work is attached to the amendment, despite eleventh-hour objections to inclusion of the list from the Munitions Board and MSA. Detailed story on the amendment is on p 150.

Any action looking toward a lower materials priority rating for builders with unrated orders has been squelched. All machine tool builders will continue to have a Z-2 rating.

• • •

Machine tool industry lifted itself in June over the $100-million-a-month mark in its "demonstrated production rate."

Index of National Machine Tool Builders' Association tells the story of what occurred the past year. Shipments in June were at 330.6 on the index. In June, 1951, they were at 182.8.

New orders jumped in June to 351, highest figure of the year. May was 284.6. Post-Korean peak of 615.3 came in February, 1951.

• • •

Washington is thinking in terms of creating a reserve of long-lead-time machine tools to meet any future emergency.

The matter was discussed in the sixth quarterly report to the President of the Director of Defense Mobilization.

Backlogs of many critical tools, the report points out, are from 20-40 months at current production rates. This fact illustrates the importance of anticipating our mobilization base needs for the more complex machine tools.

The report says further: "In time of war we would need many more of these tools than are now scheduled for manufacture—and the urgency would be even greater."

• • •

Main point is that Washington feels that requirements of long-lead-time machine tools in an all-out war should be determined now and the necessary number of tools built.

If the government sticks to this policy, builders of long-lead-time machines will be very busy for a long time ahead.

• • •

Meanwhile the Advisory Committee on Production Equipment is not getting off the ground very fast. The seventh member of the committee has just been announced—Admiral Lewis Straus, who was at one time on the Atomic Energy Commission.

Charles Stauffacher, originally appointed staff director, was out ill for several weeks. Now comes word that he is returning to the Bureau of the Budget. Thomas Craven will take his place.

A group of machine tool builders gathered in Washington on short notice on July 25 to meet with the committee, which continues to have sessions on Fridays.

• • •

Air Force has attempted to minimize the effect of its decentralization of purchases by declaring that only machine tools for maintenance work will be moved to Warner-Robins depot, which is 20 miles outside Macon, Ga.

Only 18 persons will be transferred from Dayton to Warner-Robins and only 3% of machine tools for aircraft will be bought there.

Air Force neglected to say that the three percent amounts this year to upwards of $100 million.

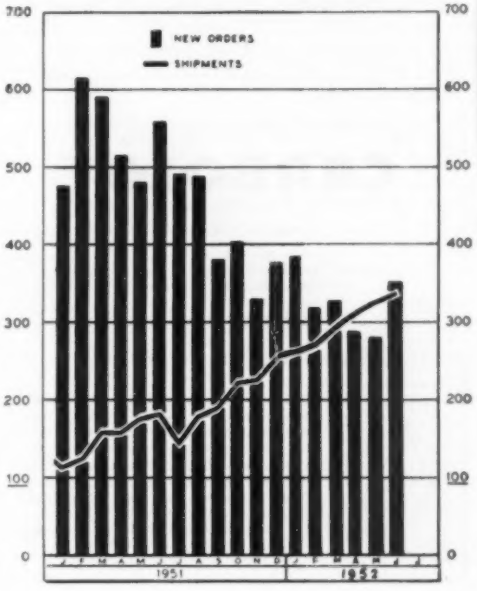
Air Force claims that it does not have storage and maintenance space in any industrial center and that Warner-Robins has long been a machine tool storage area.

Since machine tool specifications still will be written at Dayton, the change means that a considerable amount of wasteful shuttling will be done between Dayton and Macon.

Don't forget also the inconvenience and expense which this action will mean to the machine tool industry.

BF

Machine-Tool Shipments at New Peak



Are you getting maximum returns from your carbide-tool investment?

You are if your cemented carbide tools pay off with top production at top tool speeds . . .

if top tool life is combined with top adherence to tolerances . . .

if top production per tool is coupled with minimum rejects . . .

and if your investment in carbide tools is limited to universal-use standards, permitting a low inventory of special multiple-point tools.

In short, you are getting maximum returns if you use Carboloy Cemented Carbide tools, for Carboloy quality and service are designed to deliver all carbide benefits, to give you maximum returns from each dollar invested in cemented carbide tools.

Scan the Carboloy products briefly described on these pages. Then shoot the coupon at the right back to us for your free copy of the complete Carboloy General Tool Catalog.

And for your immediate carbide-tool needs, why not telephone your Carboloy Distributor right away?

Stocks now at your Carboloy Distributor's — ready for immediate delivery — will satisfy your every need in Standard Carboloy Tools and Blanks, and most special tools equipped with Carboloy Cemented Carbides. Call your local Carboloy Distributor now.

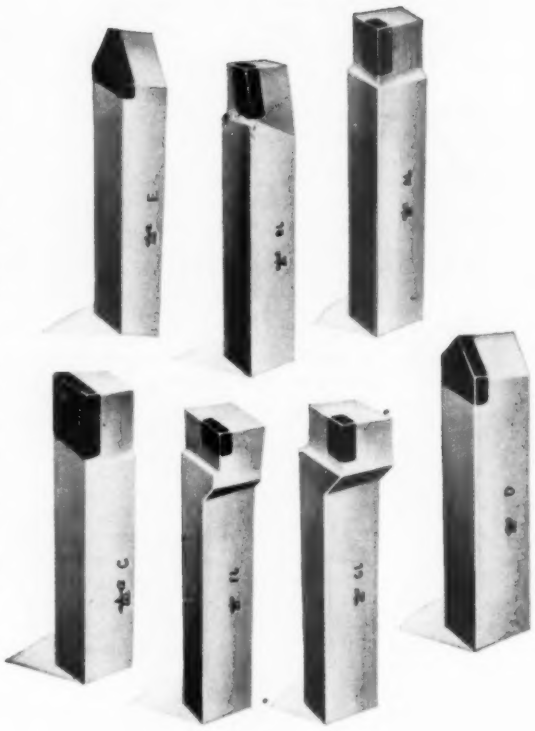
"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11149 E. 8 Mile Street, Detroit 32, Michigan

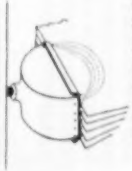
PLANTS AT
DETROIT, MICHIGAN; EDMORE, MICHIGAN;
AND SCHENECTADY, NEW YORK



11 STANDARD CARBOLOY TOOLS
Perform 80% of Your Machining!

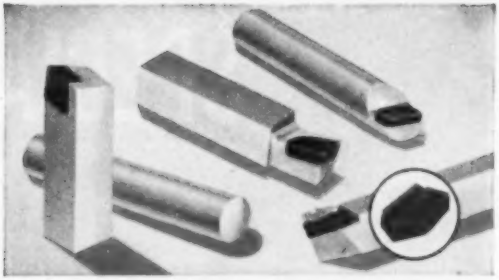
Chop your costly special carbide-tool inventories with Standard Carboloy Tools. Only 11 styles (right-hand tools not illustrated) do up to 80% of all your single-point tool machining. Whatever the job, odds are versatile Standard Carboloy Tools will do it. What's more, they'll outproduce and outlast high-speed steel tools by as much as 10 to 1! At the same time, they'll pile up savings in machine-tool maintenance, downtime and replacement. You can count on Standard Carboloy Tools, whether used "as is" or quickly and economically specially ground in your own toolroom, to do a wide variety of jobs faster, better, for less. (See pages 14-19, 20-27 in your Carboloy General Tool Catalog, GT-250.)

Magnetic ideas for the shop!



Carboloy Permanent-Magnet Sheet-Steel Separators prevent feeding of doubles. Use permanent magnets to give an extra "hand" in your shop work. Great for magnetic stands, tool-holding devices, sweepers' "pick-up" tools, magnetic paper grippers on machines, containers for small parts, and magnetic retrievers. Write for FREE Carboloy Permanent Magnet Stock Catalog, PM-100. (Use handy coupon at right.)

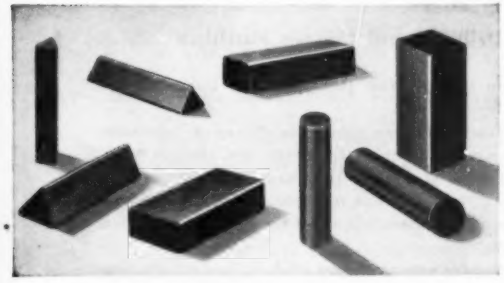
STANDARD CARBOLOY BLANKS are mass-produced, available in many styles and hundreds of sizes at extremely low prices. They are designed for broad use in most of your machining needs. Brazing Carboloy Blanks to tool shanks will handle your emergency jobs readily; no time lost on special tooling. (See pages 20-22, 32-42 of your Carboloy General Tool Catalog, GT-250.)



OTHER CARBOLOY STANDARD TOOLS in a wide selection that includes: roller turner tools, blanks for clamped-on-type tools, boring tools, and solid Carboloy cylinders that can be adapted to many special shapes in solid boring tools. All items are in stock; semi-finish, or finish-ground, ready for use. Tools that will save plenty in production. (See pages 22-28 of your Carboloy General Tool Catalog.)

SPECIAL CARBOLOY BLANKS can be furnished in any size, shape and grade of cemented carbide to meet your exact, individual requirements. In addition to general types of special shapes, flat-formed blanks with complicated shapes and a large selection of semistandard and modified blanks can be made, ground or unground. (See pages 43-44 of your Carboloy General Tool Catalog, GT-250.)

SPECIAL TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE. Carboloy Cemented Carbide is furnished to more than 250 leading tool manufacturers for use in special tools, many of which are stocked by Carboloy Distributors. Also, when requested, Carboloy engineers work with the tool maker to help his customer *(you)* solve special problems. (See pages 28-29 of Catalog, GT-250.)



CARBOLOY INSERT BLANKS are available in stock in round, triangular, square and rectangular styles in a wide variety of sizes; they are finish-ground, ready for use in your mechanical-type holders. Inserts are quickly resharpened by off-hand grinding and have several cutting edges, depending upon shape of insert. For example, ½" square insert has eight cutting edges, four on either side. (See pages 20-22 of your Carboloy General Tool Catalog, GT-250.)

Complete Carboloy Tool Catalog FREE!

It's a fact-packed 60 pages. Hundreds of illustrations showing typical uses, specifications. Also, conversion tables for cutting steels, ferrous, nonferrous and nonmetallic materials. Lists other *free* Carboloy Services, technical literature. *Send coupon below today!*

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11149 E. 8 Mile Street, Detroit 32, Michigan

Date _____

Please send me, without cost or obligation:
☐ Carboloy General Tool Catalog, GT-250
☐ Carboloy Permanent Magnet Catalog, PM-100

Name _____ Position _____

Company _____

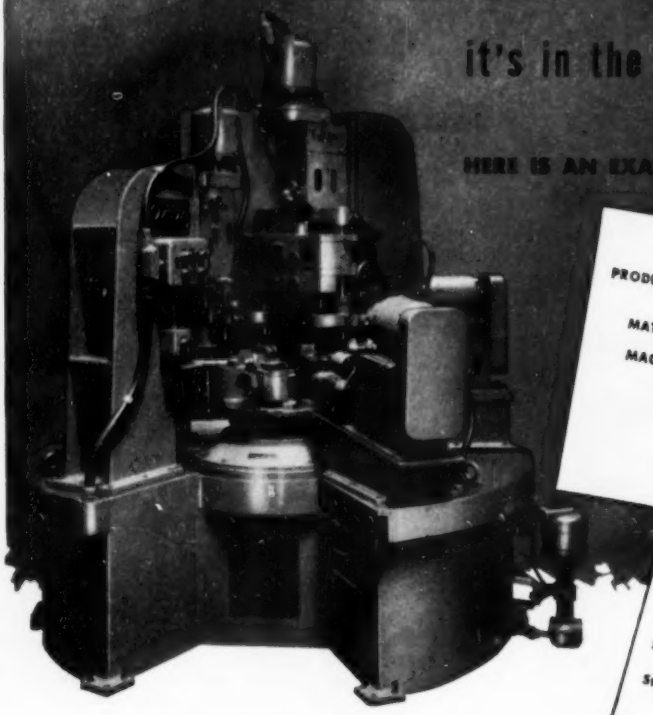
Address _____

City _____ Zone ____ State _____

If it's SPECIAL...

it's in the Avey line!

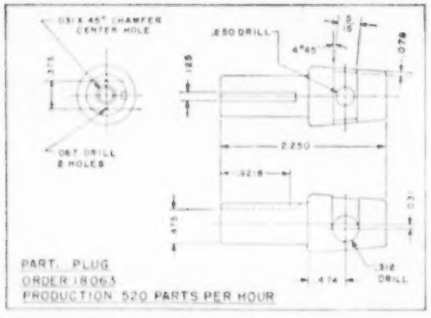
HERE IS AN EXAMPLE...



PART	Control Plug for Gas Stove.
PRODUCTION	520 Parts Per Hour at 100% Efficiency.
MATERIAL	Aluminum.
MACHINE	S. O. No. 18063—Consists of five No. 1 Avey Automatic Cam Feed Units, mounted at suitable angles around one 20" Avey Automatic Index Table. All Units arranged on one fabricated steel base which contained suitable coolant system and chip disposal.

SEQUENCE OF OPERATION

Station 1	Load and unload by quick-acting crank type fixture.
Station 2	Mill .125 slot.
Station 3	Drill one vertical .057 hole and one horizontal .250 hole.
Station 4	Drill one .057 hole and one 1/16" hole.
Station 5	Chamfer 3/16" and mill slot between the two .250 holes.



Consult the yellow pages in your phone book—under Machine Tools—for our nearest representative, or write direct to our factory.

Avey

Special Drilling and Milling Machine

Push button control! You just press the button and—bingo!—a finished part.

Operations like this mean maximum efficiency, even with unskilled help—reducing cost of piece, and part wastage.

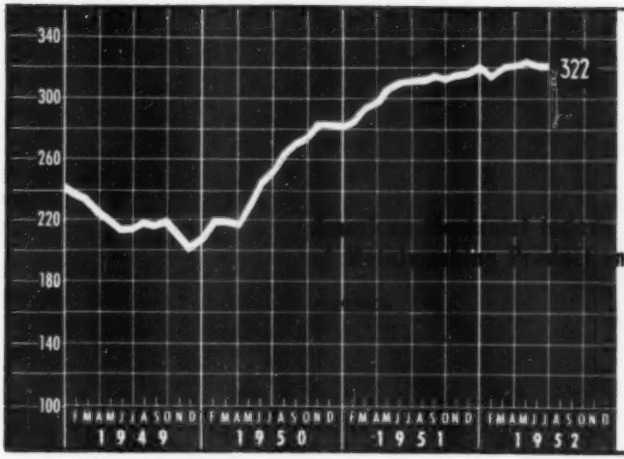
You will also be pleasantly surprised at the "Preventive Maintenance" built into this machine. The entire machine is made up of unit assemblies that have been time-tested and proven.

You don't gamble when you buy an Avey Special Machine—you can be sure.

Avey **DRILLING MACHINE CO.**

CINCINNATI 1, OHIO

Gaging Metalworking



INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JULY '52(*)	JUNE '52(p)	MAY '52(r)	JUNE '51
	322	**322**	**321**	**310**
Machinery	315	317	304	
Electrical Manufacturing	346	349	351	
Automobiles	233	230	235	
Transportation Equipment	542	526	389	
Other Metalworking	311	311	323	

(*)Estimated (p)preliminary (r)revised

How fast metalworking gets back up to where it was before the steel strike depends upon how fast steel production gets going again.

The truth is that it will take a long time for steel tonnage to become freely available.

Steel makers insist that 4-6 weeks will be needed to balance work forces, to work through semi-finished steel on hand and other steel in process, and to know where they stand.

• • •

Steel scheduled for June delivery may reach users in September. Third quarter steel is not likely to get to customers until 1953.

One steel maker says: The customer with an order on mill books, but with the initial melt not made when the strike started, has little chance of securing deliveries this year.

• • •

Steel controls probably will work this way: Bulk of steel on order June 2 will be delivered first. That includes all of third-quarter allotments and considerable tonnage hung over from second quarter.

NPA will not tamper with orders that mills already are working on, believing such action would disrupt production schedules and waste steel.

Directive powers will be used to get as much steel as possible for: (1) Military end items and components; (2) AEC orders; (3) machine tools; and (4) tin plate for perishable foods during remainder of canning season.

NPA can only see, however, that such orders get first place wherever open capacity exists. Ingots for sheet and strip can't be held back when plate, rod and other mills have all they can chew up.

Weapons output won't be back on schedule for many months. Production losses, put as high as 30% of the year's totals, are gone for good. They cannot be made up.

Big job now is to get components manufacturers into production after steel mills are running.

Long lead-time items—planes, tanks, some electronic equipment—will be slow for weeks while the "B" rated items are filling the industrial pipelines.

• • •

What's worrying steel users in various lines is the effect of the iron ore shortage on steel output late next winter or early in the spring.

Steel pinch has hit hard the farm implement industry. International Harvester, for one, is shut down. Yet demand for farm machinery has been good. Bumper crops are reported.

• • •

Railroad equipment makers say that backlogs are good, but new orders are harder to get.

Business in maintenance-of-way equipment is twice that of a year ago. And the outlook is good.

One important diesel locomotive builder has 17-months' backlog at current rates.

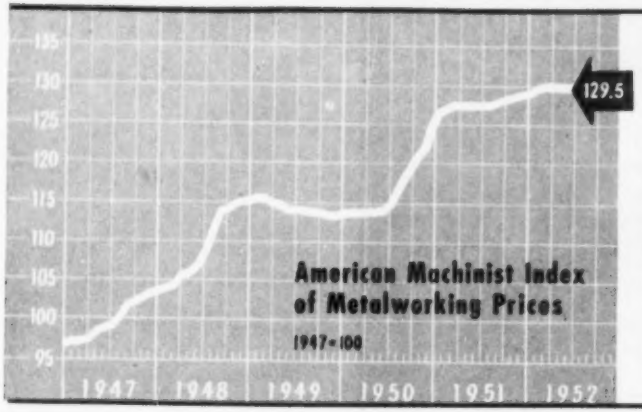
Number of railroads have stopped car building because they have run out of steel.

• • •

Heavy-goods producers say that orders are down substantially from the level of a year ago. But production remains high, and in many cases is still trending upward.

Forging people have been told that step-up in shell program is just ahead. Big problem will be to get enough steel to meet schedules.

Gaging Business



PRICE INDEX

	JULY(*) 1952	JUNE(p) 1952	MAY(r) 1952	JUNE 1951
	129.5	**129.5**	**129.7**	**127.8**
Metalworking Machinery	**136.7**	**136.7**	**133.2**	
Other Machinery exc. Electrical	**132.5**	**132.5**	**132.1**	
Electrical Machinery	**125.1**	**125.8**	**126.8**	
Fabricated Metal Products	**127.7**	**127.9**	**124.8**	

(*)Estimated (p)preliminary (r)revised

Recent reports indicate a general picking up of business. Although it still hasn't reached boom proportions, it appears to be a fairly steady trend. In May and June durable goods—autos, appliances, TV sets and radios—started moving at retail. This plus a higher volume of soft goods pushed up May and June receipts.

Man-days of idleness in May, due to strikes, rose to 7.5 million or nearly 1% of total working time of all workers. This was the highest in any month since February, 1950. And June was higher.

Hiring in manufacturing industries rose from a rate of 37 to 39 per 1000 employees between April and May. But this rate was considerably lower than the post-World-War-II average for May of earlier years.

• • •

There was some slowdown in the layoff rate in May. Factory workers were laid off at a rate of 13 per 1000. But this was the first time in a year that layoffs weren't above the rate of a year ago. June was a different story however.

Accelerated amortization amounting to about $21 billion has now been approved. The number of new or expanded facilities which have been authorized now totals more than 12,000.

• • •

Since June, 1950, $94 billion has been available for military procurement and construction. Of this total, about $34 billion has been delivered. More than $50 billion is outstanding in contracts with industry which have not yet been delivered.

• • •

By mid-July steel was short all along the pipe lines. People were being added to unemployment rolls at a rapidly increasing rate.

Now it is clear, even with peak output for the rest of 1952, steel production will be lower this year than last, although an additional 6 million tons has been added to capacity.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	210.2	212.2	233.9
Steel ingot operation (thousands of tons)	318	316	2,027
Electric power output (million kilowatt hours)	7,180	6,988	6,975
Production of automobiles and trucks	32,302	70,592	131,419
Engineering construction awards (*Engineering News-Record*—millions)	$278.2	$295.8	$251.9

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	202	214	221
Index of durable manufactures production (1935-1939 = 100)*	246	276	274
Durable goods manufacturers' sales, millions*	$11,345	$23,444	$18,923
Electrical machinery manufacturers' sales, millions*	1,099	3,027	2,338
Other machinery manufacturers' sales, millions*	2,176	3,370	2,703
Durable goods manufacturers' new orders, millions	10,650	11,570	11,653
Electrical machinery manufacturers' new orders, millions	1,088	1,243	1,246
General machinery manufacturers' new orders, millions	1,849	2,395	2,308

* Seasonally adjusted.

THE ROAD TO GOOD BROACH TOOLING

Paved by Defense Production . . . Profitable for Civilian

The demands of defense production during the second world war, as well as those imposed in the present emergency, have fostered great advancements in broach tooling. Now accomplished, these advancements are literally the signposts of broach tooling design for current defense production. Applied to civilian production they open the door to a whole new world of cost-cutting possibilities . . . parts can be processed with fewer operations, broach tooling lasts longer, minute dimensional limits can be held with ease and economical broaching production can be had without long-run production quantities.

As substantial contributors to these advancements, Detroit Broach engineers can be relied upon to incorporate the latest and finest of procedures into the design of your tooling. It will pay you to keep this in mind when considering broach tooling for your production.

Proper chip removal
Prolonged tool life
Precise form cutting
High surface finishes
High production rates
Easier loading of parts
Universality of fixtures
Automatic machine cycling
Better operator visibility
Extremely close tolerances
Consistently superior workmanship
Economy in high AND low production

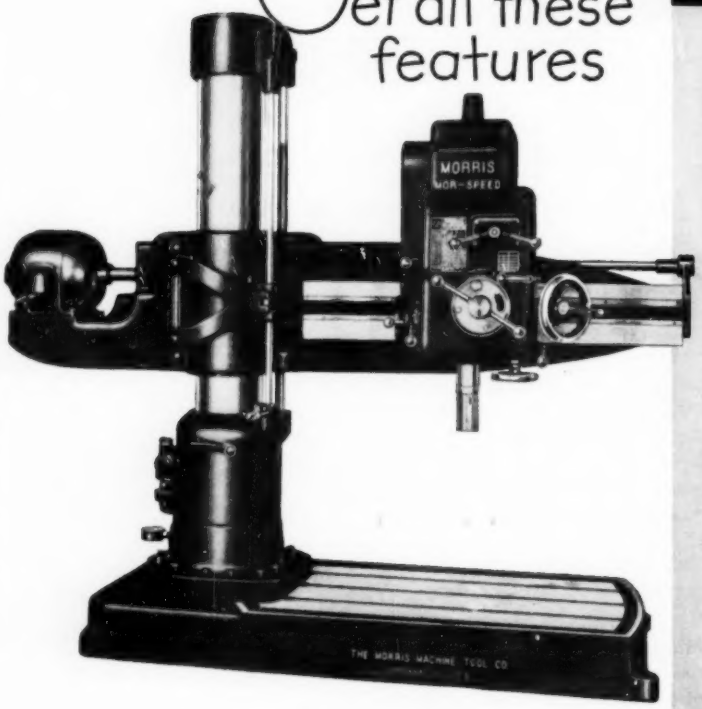
WORLD'S LARGEST MANUFACTURER OF BROACHES AND BROACHING TOOLS EXCLUSIVELY

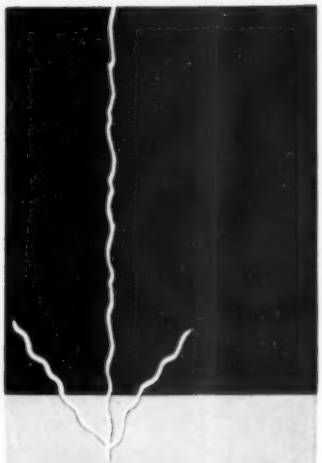
DETROIT BROACH COMPANY

20201 SHERWOOD AVE. • DETROIT 34, MICH.

for production
or tooling
drilling
reaming
or tapping

Get all these features





CENTRALIZED CONTROLS

Every control in reach, easy to operate . . . saving operator effort and production time.

VARIETY OF SPEEDS AND FEEDS

A better job faster because the right combination is easily selected.

AUTOMATIC LUBRICATION

Built-in accuracy maintained and protected for years on end by positive lubrication.

GREATER RUGGEDNESS

Every part engineered for maximum strength and balance, assuring long, useful life.

MORE AUTOMATIC STOPS

Save time and reduce manual operations to an absolute minimum.

You'll find MORRIS Mor-Speed RADIAL DRILLS' accuracy and low cost production an important advantage in the fight against rising prices. Write for your copy of the latest Radial Drill Catalog today.

a better product at less cost —with precision PLUS production

Builders of MOR-SPEED Lines

Morris

THE MORRIS MACHINE TOOL COMPANY, 933 HARRIET ST., CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Never Underestimate the Power of....

Recently, the Caterpillar Tractor Co analyzed two captured Soviet tractors which were copies of Caterpillar's own D7's.

Researchers came up with interesting and disconcerting observations. "These machines were a great surprise to us," research director J M Davies reported. "They are of much better quality than we expected."

The Reds, in the first place, redesigned the tractor to fit metric dimensions—no mean engineering feat. They knew where to make parts hard and where to make them tough. In that respect, the parts are about the same as those in Caterpillar's D7.

RUSSIAN TRACTORS have been produced to close tolerances and with good finishes where necessary. Metallurgy is good too. "On the whole," Mr Davies comments, "the Stalinetz 80 should operate satisfactorily."

On top of Caterpillar's testimony about Russian tractors is the US Air Force's evaluation of a captured MiG-15 fighter plane and its Soviet-built Nene-type turbojet engine.

"Soviet workmanship, reflected in fabrication of MiG-15 turbojet engine parts, is high, of excellent quality, and in many instances comparable to American standards and practice," Air Force experts agree.

Examination of the Russian engine's combustion chamber uncovered an astounding fact. The Soviets had overcome a design problem which until recently had been insoluble to both British and Americans.

US engineering specialists went a step farther. They expressed their belief that the Russians possess the talent to carry out successfully new developments in gas turbines.

MANY OTHER examples, equally spectacular with the two already described, are at hand to prove that, as good as we are, we do not have a monopoly on the world's scientific, engineering and manufacturing know-how.

The purpose in reciting these high appraisals of the Russians is not to deprecate our own achievements. Truly our industrial and scientific developments have enabled us to win wars and to establish firmly in America the highest material standard of living in history.

But our accomplishments often have been so lustrous that we are prone to regard ourselves as the source of all knowledge and skill. In those prideful moments we underestimate the power of others.

For our own good we should guard against indulging in such vanity. It tends to make us smug. It wins no friends but does influence people — against us.

If we maintain a healthy respect for both our allies and our enemies, we will be sure to stay on top, because the competition will spur us on to bigger and better achievements.

Burnham Finney

CINCINNATI Shears at CONVAIR

This ¼" x 18" Cincinnati All-Steel Shear, one of the Cincinnati units at Convair, has the length to cut full length standard sized sheets.

Cincinnati All-Steel Shears at Consolidated Vultee Corporation are shearing sheets straight and true in the important production of the world's largest bombers.

Illustration shows a 1/16" by 18" Cincinnati Shear, one of the Cincinnati units at Convair. Aircraft production requires unusual length as well as unusual accuracy in shearing. Cincinnati furnishes shears to the aircraft industry in lengths up to and including 24' of length in ¼" thickness.

Cincinnati All-Steel Shears will give you accurate performance. Write for Shear Catalog S-6.

THE CINCINNATI SHEAR CO.

CINCINNATI 25, OHIO, U.S.A. SHEARS • BRAKES • PRESSES

GAGE YOUR HOB SHARPENING ...and save tools

BY BEN C. BROSHEER, ASSOCIATE EDITOR

• It isn't too difficult to tell how much to remove from a dull hob, but to know how much has actually been taken off is a different matter . . . Here are two special gages that give the answer

CONTROL OF the amount of stock removed when sharpening a tool is of prime importance when attempting to minimize tool cost per part. This is especially true of gear-cutting hobs, as each 0.001 in. ground from the cutting faces will represent, conservatively, $0.10 to $0.30 (depending on size and type of hob) in terms of original cost. Every 0.001 in. ground away unnecessarily represents a material loss of potential hob life and increases the cost per gear.

So it is important to be able to determine how much stock should be removed to sharpen a hob to the desired quality, and to be able to check the grinder's work and make certain he hasn't ground away more material than was specified—"just to be sure."

In this regard, it is well to remember that tests conducted several years ago by a major hob producer indicate that, in some cases, hob life may be increased by not sharpening off all signs of wear back of the cutting faces.

Determination of the amount to be removed should not be left to the tool-grinder's judgment. It should be specified by an experienced tool inspector familiar with the job for which the hob is to be used.

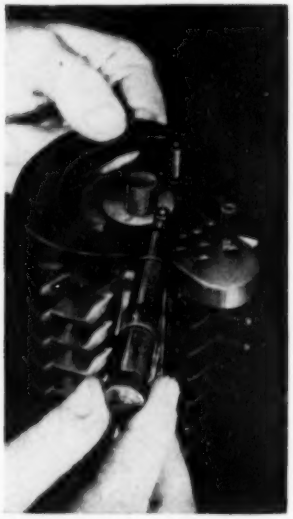
Most gear shops now follow this practice, but depend only on visual inspection and "guesstimating" to decide how much stock should be removed. A few shops, however, have made up special inspection gages, usually involving the use of some form of toolmaker's microscope, to measure hob wear. These shops generally employ a tag on which grinding specifications can be marked to advise the grinding crib what to do when sharpening each hob.

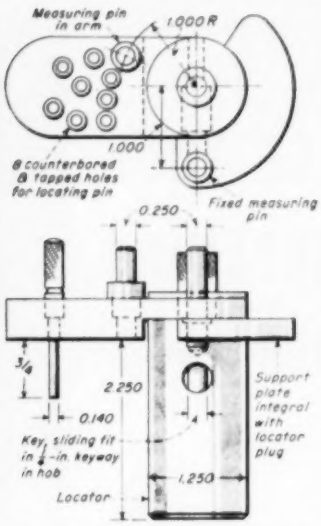
But inspection of the sharpened hob, to determine how much stock actually was removed, is another matter. Only a few shops have realized the savings in tool cost which can be achieved by checking the sharpener's

Devised by Barber-Colman hob engineers to study causes and rates of hob wear under different operations, this optical gage determines stock removal necessary to resharpen a hob. Microscope has paired 10X eyepieces, one with a micrometer disk calibrated to 0.001-in. and the other with crossed hairlines, and 2.0X objectives. Holders support hob horizontally for checking wear on periphery and tooth corners, and tilted for checking flank wear

Courtesy Barber-Colman Company

Wear land on hob tooth shows up distinctly in microscope and can be measured by micrometer adjustment of table under hob support to align hairline first with cutting edge of tooth, then moving it to bring hairline across point of deepest wear. Difference in micrometer readings gives amount to be ground off in sharpening





Adjustable gage developed at the Tractor Works, J I Case Co, for measuring amount ground off cutting faces of hob teeth can be set for all sizes of hobs used in the plant. Reading across fixed measuring pins is translated into equivalent radians by reference to conversion table. Only eight parts are required to make the gage. Key in locator plug aligns fixed measuring pin with keyway in hob bore. Arm is swung to bring locating pin in contact with cutting face of hob tooth

work with measuring gages. Possibly this is because of the difficulty of measuring accurately the amount of material removed, and to the lack of any standard gages for the purpose.

Two shops recently visited have solved this problem by making special gages with which micrometers can be used to measure stock removal. Working independently, but almost simultaneously, the Tractor Works of J I Case Co and the Chevrolet-Muncie Div of General Motors Corp developed the gages illustrated.

Both shops use these gages in connection with a tool quality control program which has resulted in major tool cost reductions, as well as in continued improvement in product quality. In both cases, gage measurements are recorded on hob data cards that permit full analysis of tool cost per part.

While the Case gage measures the position of the cutting face of one tooth (marked on each hob) in relation to the keyway in the bore, and the Chevrolet-Muncie gage measures the distance between the cutting face and rear face of a marked tooth, the results are the same. Each of the gages has some advantages, and some disadvantages, as compared with the other.

Case Gage

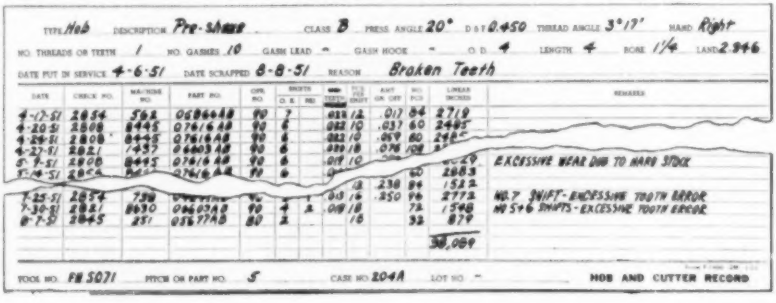
The Case gage is adjustable for all hob sizes from 2.250 to 4 in. OD (all with 1.250-in. bore) so only one gage is needed. But micrometer measurements must be translated in terms of equivalent radians, because the micrometer measurements are made across two pins, each 1.000 in. away from the center of the locator plug, and the locating pin contacting the cutting face of the tooth is positioned a greater distance from the hob center.

Actual micrometer readings are converted to equivalent radians by use of a conversion table.

The difference between two successive readings of equivalent radians (before and after a sharpening operation as recorded on a hob data card) then is the number of radians ground off the cutting faces. This value usually is ex-

Micrometer Reading	Equivalent Radians	Micrometer Reading
1.610	1.496	1.640
1.611	1.497	1.641
1.612	1.498	1.642
1.613	1.500	1.643
1.614	1.501	1.644
1.615	1.502	1.645
1.616	1.504	1.646
1.617	1.505	1.647
1.618	1.507	1.648
1.619	1.508	1.649
1.620	1.509	1.650
1.621	1.511	1.651

CONVERSION TABLE from micrometer inches to equivalent radians saves inspector's time and avoids errors. Measurement over pins, less dia of pin, equal twice the size of the angle between pins. Value of angle in equivalent radians is obtained by multiplying the value in degrees by $\pi/90$

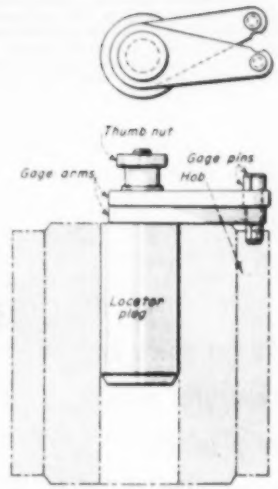

TYPE Hob DESCRIPTION Pre-Shave CLASS B PRESS ANGLE 20° D B T 0.450 THREAD ANGLE 3°17' HAND Right
NO. THREADS OR TEETH 1 NO. GASHES 10 GASH LEAD — GASH HOOK — O. D. 4 LENGTH 4 BORE 1¼ LAND 2.946
DATE PUT IN SERVICE 4-6-51 DATE SCRAPPED 8-8-51 REASON Broken Teeth

DATE	CHECK NO.	MACHINE NO.	PART NO.	OPN. NO.	SHOTS O. K.	SHOTS NO.	MIN. STOCK REMOV.	TOTAL STOCK REMOV.	AMT. GROUND OFF	NO. PCS.	LINEAL INCHES	REMARKS
4-17-51	2854	561	0586648	90	7		035 12	.017	84	2719		
4-20-51	2808	8445	0761648	90	6		082 10	.037	60	2495		
4-26-51	2808	8445	0761648	90	6		082 10	.069	60	2486		
4-27-51	2821	7457	0660348	90	6		099 18	.076	108	3		
5-7-51	2808	8445	0761648	90	6		077 10				2429	EXCESSIVE WEAR DUE TO HARD STOCK
5-14-51	2854	561	0761648	90	6					60	2083	
7-25-51	2854	738					03 16	.250	96	2772		NO. 7 SHIFT - EXCESSIVE TOOTH ERROR
7-30-51	2821	8430	0660348	90	4	2	099 18			72	1548	NO 5 & 6 SHIFTS - EXCESSIVE TOOTH ERROR
8-7-51	2845	251	0567748	80	2		16			32	879	
											30,089	

TOOL NO. FH 5071 PITCH OR PART NO. 5 CASE NO. 204A LOT NO. — HOB AND CUTTER RECORD

HOB RECORD CARD used in gear laboratory at Case Tractor Works gives complete description and history of hob and its production efficiency. Hob cost per part produced can be computed easily

DISTANCE between front and rear faces of marked hob tooth is measured quickly with simple gage devised by master mechanic's department in Chevrolet-Muncie plant. Difference between micrometer readings before and after hob is sharpened show stock removed without need for conversion table



SIMPLE construction of the Chevrolet-Muncie hob-sharpening gage keeps cost low, so separate gage can be made for each hob size without making tool cost excessive. The two gage arms are centered on extension of locator plug with snug slip fit

pressed as a decimal within the range: 0.005 to 0.100.

The radians ground off can be translated in terms of decimal parts of an inch by multiplying the equivalent radians by the radius of the swing of the locating pin in the movable arm of the gage. The eight radii of swing obtainable by inserting the locating pin in the various holes are:

Hole No.	*Radius (In.)*	*Hole No.*	*Radius (In.)*
1	1.1250	5	1.5000
2	1.1875	6	1.6250
3	1.2500	7	1.7500
4	1.3750	8	1.8750

However, for all practical purposes, the value for equivalent radians is a sufficient measure of how much stock has been removed. It is seldom necessary to calculate the actual thickness of stock removed.

The Case gage consists of a locator plug which is a slip fit in the hob bore and has an integral plate at one end to support the fixed measuring pin. A key in the locator aligns the fixed measuring pin with the keyway in the hob.

Moving member is an arm which is free to rotate about an extension on the locator plug. Set vertically in this plate is the movable measuring pin and the locating pin which is positioned in the arm to contact the face of the tooth to be measured. There are eight locations in the arm for positioning this pin to suit hobs of different diameters.

Chevrolet Gage

The Chevrolet-Muncie gage is simpler in design and construction than the Case gage, but is not adjustable. It consists, basically, of a hardened locator plug finished for a slip fit in the hob bore. Two sizes of locators are used in the five gage assemblies: 0.8735-0.8740-in. and 1.2485-1.2490-in. dia. Each has a 0.3740-0.3745-in.-dia extension, 0.503-0.504 in. long on one end to locate the two 0.250-in.-thick gage arms. Five lengths of gage arm are needed, to suit varying hob dias and tooth depths. Headed gage pins are pressed into the outer end of each arm, to provide for location against front and rear faces of the tooth.

Micrometer measurements of tooth thickness are made by measuring across the heads of these two pins. Micrometer readings are direct measurements of tooth thickness, as the measuring pins are concentric with the pins contacting front and rear tooth surfaces. But a separate gage is needed for each hob size.

Locator plug, arm, and thumbscrew of the Case gage are made from low carbon steel; all other parts are of tool steel. All parts except the thumbscrew are hardened and ground to minimize wear.

In the Chevrolet-Muncie gage, the locator plug, washer, and thumbnut are made from SAE 1020 steel, the gage arms are SAE 1040 steel, and the gage pins are drill rod. Only the locator plug is carburized, hardened, and ground. The other parts are left soft, but are ground to size.

Tool No. 1W-2200-1 Cutter No. 9
Date Rec'd 6-29-51 Size D. G. .900

Size A. G.	Date Out	Size A. G.	Date Out	Size A. G.	Date Out	Size A. G.	Date Out
.890	7-5	.705	10-15				
.865	7-14	.693	10-25				
.850	7-20	.669	10-31				
.820	7-30	.645	11-4				
.802	8-13	.630	11-15				
.770	9-4	.610	11-20				
.750	9-8	.590	11-23	Scrapped 11-29-51			
.732	10-1						

FULL HISTORY of hob or cutter is maintained on this card in master mechanic's office at Chevrolet-Muncie plant, even when hob may be used for cutting several different gears

Scheduled lubrication is one phase of Westinghouse program of preventive maintenance. Schedules vary depending on truck and work performed. Because of extra heavy usage, fork trucks are checked and lubricated more often than platform types

To cut down on repetitive repairs... to eliminate unexpected breakdown and resulting production delays... to guide equipment purchasing and replacement...

TRY THIS PLAN FOR INDUSTRIAL-

7-38	MAKE AAA	TYPE E-36 Lift	TRUCK NO. 112
BATTERY	MAKE Lead Type or Edison		A.H. 500 A.H. 18 Cell 21 plate
TIRES	DRIVE 20X6X16		SIZE 10X6X6 1/4

SERVICE RECORD

DATE	KIND OF TROUBLE AND WORK DONE	OPERATOR'S REPORT
4/25/50	2-Rear knuckle brgs @ 3.60 - 7.20	
	1 " " pin 2.70 - 2.70	
	2-10X6X6 1/4 Tires @ 12.90 - 25.80 - 35.70	
11/27/50	Weld tie rods	
3/5/51	2-Breaker tips-repair	
9/1/51	Horn repair-grounded wire	

Individual record file is kept on each truck. Cards are reviewed semi-annually and further maintenance schedules are planned accordingly. Excessive costs are spotted easily

BY MARTIN A LYONS
Supervisor of Transportation
Feeder and Service Division
WESTINGHOUSE ELECTRIC CORP.
East Pittsburgh, Pa.

Industrial-truck maintenance at East Pittsburgh is far more than simply a service and repair function. Since its organization about 40 years ago, our repair department has concentrated not only on service but also on finding out why each repair was necessary and what could be done to prevent recurrence.

Once determined, this information is extremely useful in many ways. It helps us set up schedules of service and overhaul. It helps us learn the varying characteristics of the many makes of trucks

REPAIR GROUP DAILY WORK REPORT

DATE 2/1/52

1st shift

TRUCK	REPAIRS REQUIRED	BY	RELEASED YES	RELEASED NO	TIME IN SHOP	REMARKS
# 106 OPERATOR # 39	New front tires	# 293	✓		IN 9:00 OUT 12:15	
TRUCK # 135 OPERATOR # 212	REPAIRS REQUIRED Horn shorted	BY # 299	RELEASED YES ✓	RELEASED NO	TIME IN SHOP IN 10:00 OUT 10:15	REMARKS
TRUCK # 92 OPERATOR # 84	REPAIRS REQUIRED Armature	BY # 299 79	RELEASED YES	RELEASED NO ✓	TIME IN SHOP IN 1:00 OUT	REMARKS Pull armature send out for repairs Truck out for 3 weeks
TRUCK # 110 OPERATOR # 60	REPAIRS REQUIRED Steering rod dropped - replaced pin	BY # 291	YES ✓	NO	TIME IN SHOP IN 1:30 OUT 2:30	REMARKS
TRUCK # 118 OPERATOR # 38	REPAIRS REQUIRED Chain jumped sprocket	BY # 293	RELEASED YES ✓	RELEASED NO	TIME IN SHOP IN 1:30 OUT 4:15	REMARKS
TRUCK # OPERATOR #	REPAIRS REQUIRED	BY #	RELEASED YES	RELEASED NO	TIME IN SHOP IN OUT	REMARKS

TRAILER	GREASED	REPAIRED	TIRES USED
# 670	✓	New deck	10 x 3 - 2
# 802	✓		10 x 3 - 2
# 590	✓		12 x 3½ - 2 - 10 x 3 - 2
# 413	✓		10 x 3 - 2
# 116	✓	New deck	10 x 3 - 2
#			
#			
#			
#			
#			

Batteries watered and cleaned 8-96-72-110-112-117-121-125

Trucks greased 134-135-136

Daily work report provides information for posting on record card for each truck. Report is made out for each shift. Majority of lubricating is planned so it can be done on second and third shift

TRUCK MAINTENANCE

in service. And, in most cases, it helps us to tell where to look for trouble before it arrives. But, to be readily available for all, this information requires records.

Records are the backbone of our maintenance programs. Yet they are not elaborate and do not require extensive posting to keep them up to date. In all, we have a total of three file records plus a lubricating schedule and a storeroom record on replacement parts. These give adequate control over maintenance and help us get the most from our truck investment.

What Records Are Needed?

1. **A file on each make of truck**—We have found that trucks, like anything mechanical, have distinguishing characteristics. We have tried to note these characteristics: some good and some bad, under the manufacturer's name. We have helped ourselves in diagnosing trouble and, at the same time, have been able to point out to the manufacturers some things they could improve on their trucks. This general file also is useful in planning purchases of new trucks.

2. **Individual truck records**—Each truck carries a number in our repair records for identification and also for shop purposes. An individual record file is kept for each truck according to number. The make of the truck, year it was put in service, plus tire sizes and battery size, are recorded at the top of each card. The lower part and back of the card are spaced for recording maintenance work performed on each truck. A semi-annual review is made of these individual records, and further preventive maintenance is planned according to the findings. Excessive maintenance, of course, shows up plainly, and when a truck is being brought in too often, it is pulled out of service for a thorough and general overhaul.

Complete overhauling jobs are planned according to the make and type of truck and the nature of the work it does. Certain trucks that have been assigned to particularly dusty or rough work are usually given a general inspection every six months and replacements made where necessary. We have found, from our records, that if these trucks are scheduled for general inspection every six months, our replacement part requirements are fewer. Trucks in general shop use are scheduled for over-all inspection, cleaning and painting every eighteen months. There are always one or two trucks on the repair floor in this process.

3. **Lubrication schedule**—A master sheet carrying all truck numbers is kept for our lubrication scheduling. Here again, we found that the same treatment would not apply to all trucks. Some trucks require two lubrications a month, others do well with only one, depending on difference in construction and work performed. Our repair gang seems to have adopted the slogan that "A Well-Lubricated Part Never Wears."

Most of the lubricating is done on second and third shifts. Trucks are blown off first and placed on a hoist where the fittings are easy to get at. Fittings must all be wiped after lubricating. Each shift turns in a report of work per-

Tire changes are made on 75-ton hydraulic press. Selection of proper grade of rubber for service requirements has increased tire life

formed and our records are marked accordingly. Every morning three trucks are held in the repair plant for a quick inspection by our head repairman. This inspection concerns only the kind of lubricating job being done and a try-out of the brakes and steering.

Our repair people take pride in the trucks assigned to them for lubricating and cleaning. They pay particular attention to the length of time their trucks stay out of the shop without breakdowns. They seem to feel that a breakdown on one of their trucks reflects on their ability to do a good job. This pride of workmanship has created a good-natured rivalry that the men enjoy, and that certainly helps to keep our trucks in tip-top condition.

4. **Battery records** — As most of our 110 trucks are battery-operated, good maintenance of batteries is important. Most of the charging is done on the second and third shifts. A certain number of batteries have been assigned to each shift for charging, watering, and cleaning. Here again, pride in a job well done is very much in evidence. Batteries are cleaned and watered on schedule and a report of each day's activity is turned in for transposing to a master record for batteries only.

All of our people have been well-trained in proper charging techniques from motor-generators with a manually operated control panel. Of course, characteristics of different battery makes must be carefully watched with a manual charging operation. We have had a minimum of battery damage because of faulty charging, and our battery life compares very favorably with fully automatic charging setups.

A numbered, metal tag is placed on each new battery received in our plant. This number is recorded with the date the battery is put into service and remains on the battery until it is taken out of service. Then the total number of months the battery was used is recorded. From these battery records we have been able to determine where our dollars will mean more in purchasing new batteries.

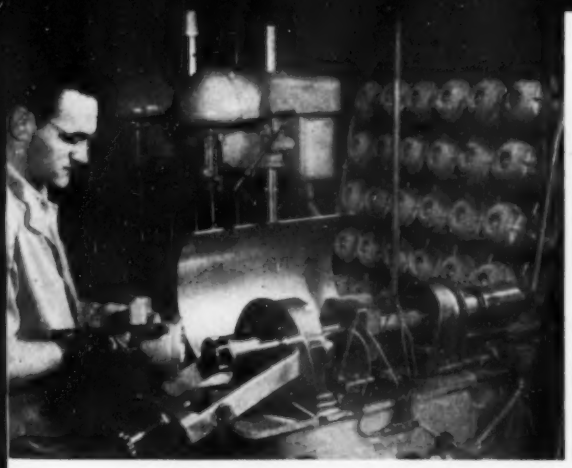
5. **Equipment for service and repair**—As I have previously stated, we have 110 trucks of all ages, makes, and types. These include some 38-year-old flat trucks, still operating, and some of the latest fork trucks. Naturally, it takes more than records to keep these trucks running. Though our charging and repair garage is small, it is well equipped.

A cleaning and painting room is located in one corner of the plant. It is equippped with a steam-gun cleaning pit, and jib crane for thoroughly degreasing and cleaning trucks on schedule or prior to painting. A hydraulic hoist is conveniently located for lubrication and inspection purposes. We are equipped to do our own pressing on and off of industrial tires with a 75-ton press. Brake shoes are relined on a riveter similar to those found in automotive repair shops, and a special brake gage is used for setting the shoes on the wheels. We have enough machine tools to take care of most machining needs.

6. **Parts storeroom record**—A parts storeroom is a necessity with any maintenance operation. Our records help here, also. We try to keep an adequate supply on hand so trucks will not be down too long waiting for parts. The storeroom is divided into sections for each make of truck. Every part received in the storeroom is tagged, priced, and dated. When a part is withdrawn, the information on the tag is recorded. Truck tires are also kept in stock. We have had representatives from the major rubber companies analyze our rubber requirements and recommend the proper grade. With the help of these representatives, we have been able to improve tire life.

The truck maintenance crew also cares for some 1800 trailers, 3000 steel trays and other material-handling aids used in conjunction with industrial trucks. This maintenance crew consists of five men on first shift, two on second shift and two on third shift.

Records, as you can see, are very important in our setup, but it takes intelligent, hard work by our maintenance crew to make the records mean anything.



Special knurling machine operates automatically, once started. After cylinder is clamped against faceplate, air cylinder feeds knurling tool to depth and leadscrew advances knurling head into cylinder. Cam at rear controls point at which knurling is performed

KNURLING UPS WEAR RESISTANCE OF CHROME PLATE

BY EDMUND F DISCOE, Master Mechanic
McCULLOCH MOTORS CORPORATION, Los Angeles, Calif

Knurling prior to chrome plating is performed on all cylinders of engines for McCulloch power saws. Knurling provides identical reservoirs for oil on all cylinder walls, resulting in uniform lubrication and improved wear resistance of the plated surface. The knurling process, developed by McCulloch, is employed in place of a partial deplate, which commonly is employed to increase the lubricating properties of chrome-plated surfaces.

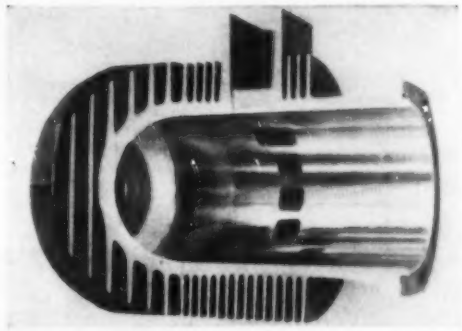
Knurling is performed in a special machine built by McCulloch for the job. Depth of the knurl is approximately 0.007 in. The cylinder then is honed, chrome-plated, and honed a second time to remove the fuzzy excess that tends to build up around the edges of the knurl. Final depth of the knurl after honing is approximately 0.003 in. and the surface finish is 5 to 8 microinches rms.

The knurl is HSS and is rounded in cross-section and at the ends to avoid sharp corners, which are difficult to plate. An air cylinder actuates a cam in the knurl holder to advance the knurl to the required depth. Three rollers bear against the ID of the cylinder, taking the thrust of the operation, compensating for any variation in the bore, and maintaining the knurl holder in the center of the bar.

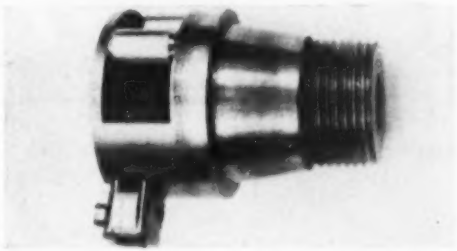
The knurling head is direct-connected to a leadscrew and rotates in the bore during the operation. The leadscrew through a fixed nut advances the knurl and air-cylinder assembly along the length of the cylinder. A limit switch in a fixed location at the rear of the machine is acted upon by a cam on the movable cylinder assembly to shut off air pressure and retract the knurl from the surface across those areas on which no knurl is required.

In one cycle, the knurling head moves into the cylinder approximately ¼ in., then the cam actuates the limit switch causing the knurl to feed into the wall of the cylinder. Knurling continues until the intake and exhaust ports are reached, where the cam causes the limit switch to shut off the air and retract the knurl. Later the cam again feeds the knurl to depth for the section of the cylinder beyond the ports and up to approximately ¾ in. from the top.

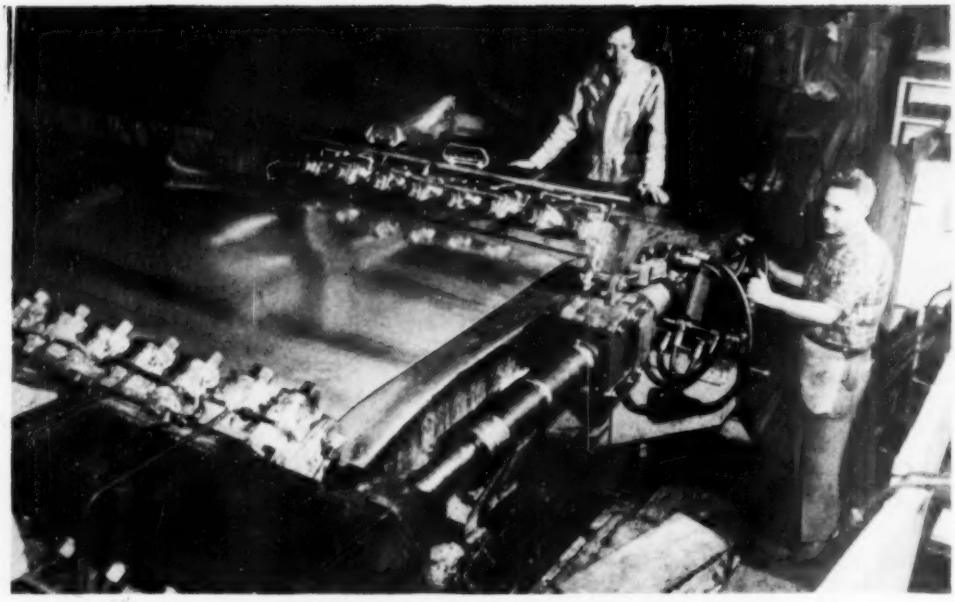
The machine knurls on both the forward and advance strokes, with only one pass being required per piece. Production is 70 pieces per hour.



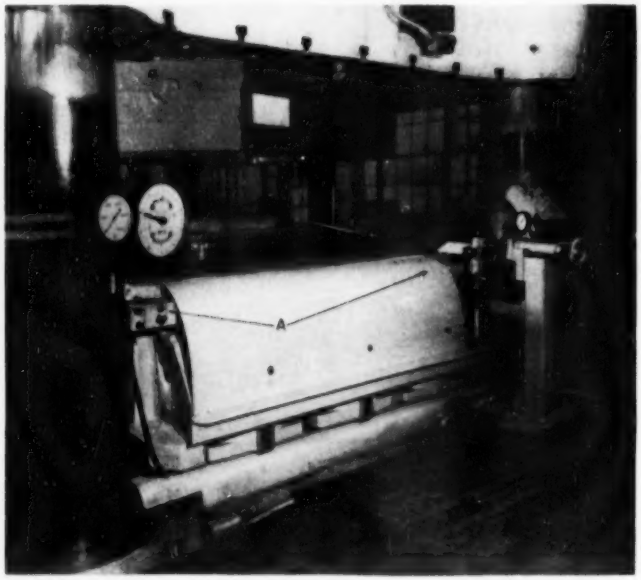
Knurled surface of cylinder provides oil pockets that improve lubrication characteristics of cylinder wall. Cylinder is aluminum die-casting



Knurling tool is fed to depth by cam actuated by air cylinder under control of master cam at rear of special knurling machine



ERCO STRETCH-FORMING PRESS is beefed up by two hydraulic cylinders (at each end of table) to give it power to handle heavy-gage aluminum required for new airplane. Power is from portable source nearby



MARFORM PRESS used for work over its normal capacity is strengthened by 7-in.-thick armor plate from scrapped Japanese battleship. Heavy plate (A—edge visible under dials at left) was machined to replace old piece in press superstructure, where it takes 7-million-lb load

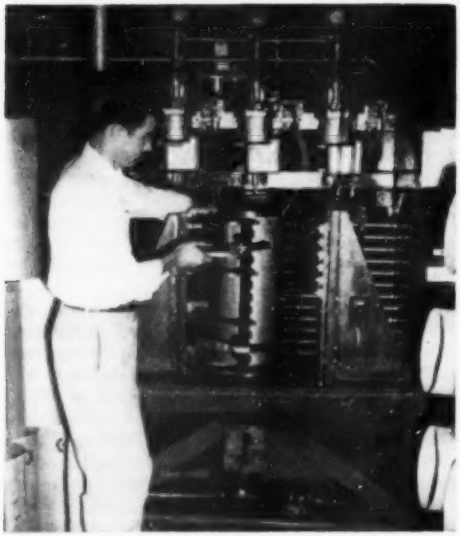
SHOP SHOTS

AT GLENN L MARTIN CO

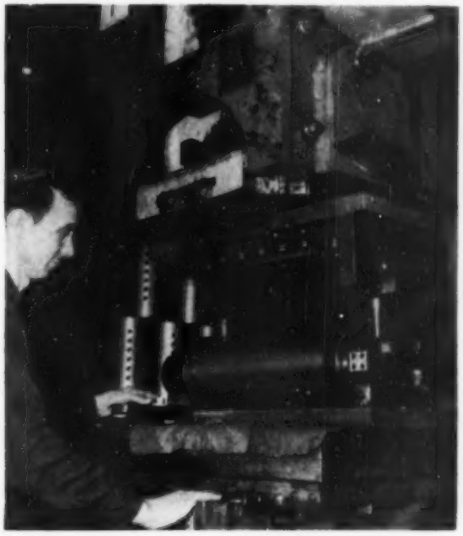
FIXED ROUTER HEAD and rotating fixture on worktable trim edge of nose section for airplane. Tooling increases speed and accuracy of cut

HOT-SPINNING JOB on lathe closes end of chrome-steel tube for aircraft frame to give increased uniformity and speed on operation. Hydrogen flame heats tube to cherry red, which anneals the steel; then spinning tool on slide is advanced

AT RYAN AERONAUTICAL CO



INNER COMBUSTION CHAMBER for J-47 engine is spot-tacked over hydraulically expanded mandrel to form a cylinder. Firing is mechanical through electronic controls, with four electrodes shooting in each of three concurrent cycles. Next, chambers are seam-welded



HOLES ARE PUNCHED in chamber by press that works over indexing mandrel. Ten holes are punched in a line at each stroke, operator hand-indexes mandrel, then next row is punched. Each chamber has eight rows of holes

OPTICAL COMPARATORS SIMPLIFY INSPECTION OF TURBINE BUCKETS

Turbine buckets require high accuracy in foil contours and in the relationship of the foil-section location with the root

Accuracy in foil-section contours is of prime importance in turbine buckets, as is location of the foil section relative to the root . . . Here is how these parts are inspected on optical comparators

PRIOR TO 1939, Jones and Lamson Machine Co developed a means of inspecting concave valve contours on optical comparators. Briefly, it consisted of tracing the contour of a valve with a stylus paired with another in front of the comparator projection lens. The path travelled by the second stylus was projected through the lens system to the screen where a master outline was charted. Variations in contour were easily measured by the position of the projected stylus relative to the master outline on the chart.

Later, this tracing technique became important to turbine manufacturers who were looking for a rapid method of inspecting turbine buckets, compressor blades and vanes. Inspection of these parts was usually done with surface plates and height gages, or with guillotine gages where differences between the part and the gage were measured with feeler gages. Templets for the guillotine gages were already being inspected on optical comparators.

SIDE-SCREEN COMPARATOR FOR FOIL-CONTOUR INSPECTION

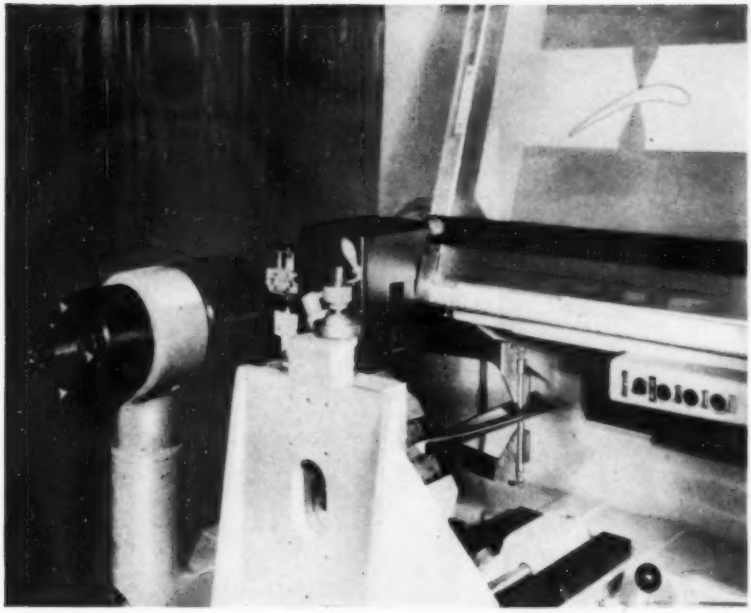
A SPECIAL J&L comparator was developed capable of using the 6-in.-dia, 5-power lens as well as the standard 10- and 20-power lenses. As in inspecting valve contours, the sections of the foil end of a turbine bucket are transferred through a tracing mechanism and through the optical system for comparison with an enlarged master outline on the receiving screen. The 5-power lens permits inspection of buckets with chord lengths up to 6 in. with one pass of the tracing fixtures.

The screen of the new machine was placed at the right of the projection lens for ease of observation because it could be located at eye level. Two features of the machine that made inspection of turbine buckets possible are the tracing fixture and the mounting fixture.

The tracing fixture has two arms that move vertically on precision ball bearings which run in vee rails on the center column of the fixture. Vertical movement is balanced so that not more than a few ounces of pressure are exerted by carbide stylii on each end of the arms when the bucket is traced. The tracing fixture is mounted on a table which has 6 in. of lateral travel in front of the projection lens. The usefulness of this fixture lies in the fact that the projected stylii follow the identical path that the tracing stylii take.

To orient two airfoil sections of a bucket, a universal mounting fixture was developed. Although it is relatively easy to orient one section; in the process of orienting a second, the first location is lost. Therefore the universal fixture is made so all the adjustments are pivotal with the axes which intersect at the first section to be oriented. A lever operated chuck with two self-centering jaws hold the bucket at the root and may be rotated on its own axis through 360°.

In operation, the root section is the first section to be oriented, with the tip section as second. The mounting fixture, therefore, is primarily for the purpose of orienting the second section of the bucket after the first has been located. The pivotal adjust-



Contours of bucket foil sections are checked by traversing styluses around them on the "Side-Screen" comparator, the path being reproduced on a charted master outline by corresponding movements of a second pair of stylii connected to the first

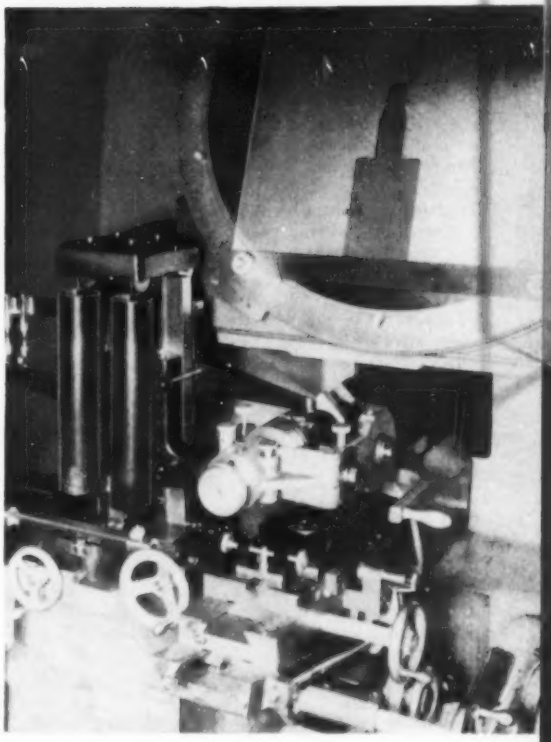
Foil contours through various sections along a bucket axis are checked on a master chart. Outlines are inscribed according to spacing of various sections in relation to each other and twist angle

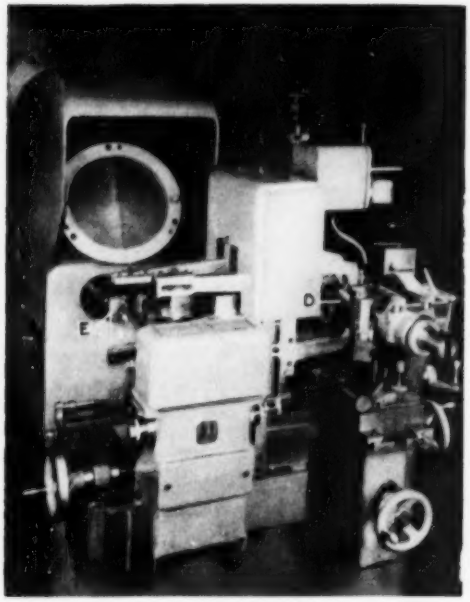
ments allow the operator to raise and lower the tip like a see-saw, and to swing in the horizontal plane without materially affecting the location of the root section as that is the pivot point of both movements. The blade may also be rotated in the chuck about the center line to compensate for warp-angle errors.

OPERATION OF THE SIDE-SCREEN COMPARATOR

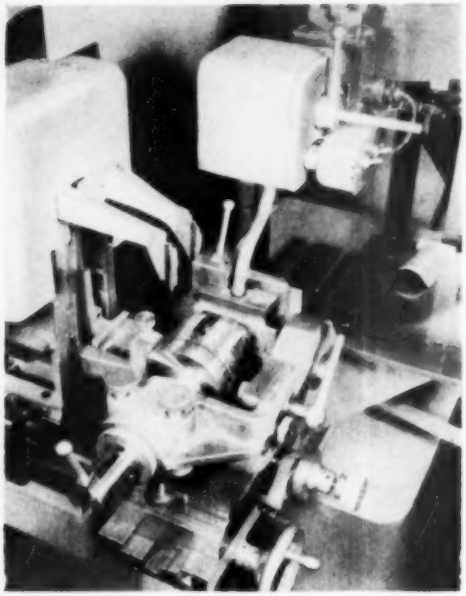
THE MOUNTING FIXTURE is clamped to the worktable at the right of the tracing table under the receiving screen. For orienting the root section of the blade, the worktable has such motions as lateral travel, vertical travel, and an in-and-out travel. All movements of the worktable and the mounting fixture are measured by graduations so the operator may determine the exact amount that the bucket deviates from the master setting gage with which he set up the machine originally.

With the machine set so that the tracing fixture traces a setting gage or master blade and the projected stylii follow the correct lines on the chart, a bucket to be inspected is clamped in the self-centering jaws of the chuck. The worktable is moved in or out so that the stylii trace the root section, both concave and convex sides being traced at the same time. The amount this section deviates from the norm is instantly discernible because the error is magnified by the lens system and projected onto the screen directly in front of the operator. The chart may have tolerance lines, or the error at any given point may be measured with a glass scale which the





Sections of foil are inspected simultaneously in this Duo-Section comparator. Movement of stylus around bucket *D* is followed by glass reticle *E* in front of projection lens



After inspection, the foil end of a bucket is cast in low-melting-point alloy in a special fixture on Duo-Section comparator. This insures proper relationship between foil end and root in following machining operations

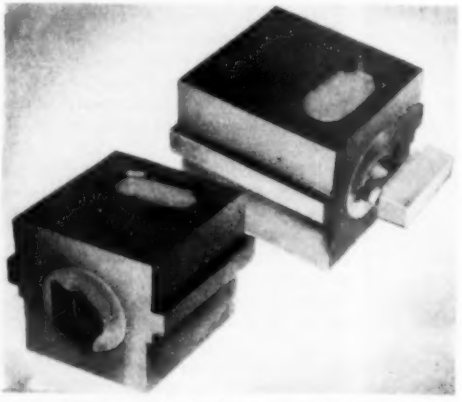
operator can lay on the master chart. After the root section is checked, the worktable is moved out to each of the other sections to be traced, using a latch bar or some similar device to determine the section spacing on the blade, the same procedure being followed to determine errors at these sections.

There are several variations of this inspection method. For example, it is possible to have the sections on the chart separated vertically so the operator need never be confused by which line he is following. This method must also incorporate an inclined worktable to bring the various sections into position for tracing on different levels.

Another variation allows the inspection of forging of dies. In this process, a single-arm tracing fixture is used, with the die held on top of the worktable. Any section may be traced and compared to the master outline on the screen.

CASTING BUCKETS IN FIXTURE FOR MACHINING AFTER ORIENTING

THE MAJOR variation on the original inspection method came about when the bucket manufacturers needed some means of holding the piece so it could be machined after it was oriented. This need was answered by a mold slide added to the large side-screen comparator and a new Duo-Lens machine specifically built for orienting, and molding buckets in blocks for machining. The mold slide has a box or shuttle that can be moved to enclose the airfoil section after it has been located properly. The shuttle is then poured full of a low-melting-point alloy which holds the bucket in the block with the root and shroud ends exposed. The block of matrix or the shuttle can then be used as a workholding fixture for grinding the root in proper relationship



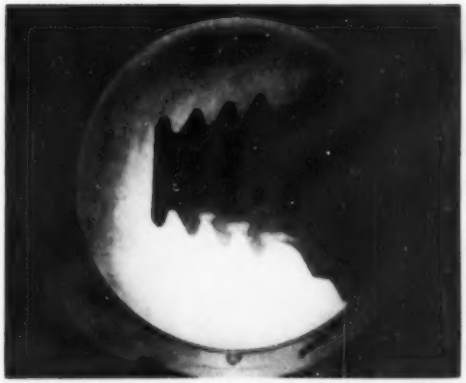
Matrix boxes in which buckets are cast. Shroud and root ends project for machining operations

to the airfoil section because the work cannot move.

The Duo-Lens machine makes it possible to check the root section of the blade as well as the tip section at the same time. This speeds the operation up to where it is now possible to orient and cast a rough forging or casting, in something under two minutes each.

Advantages of the optical inspection and molding method of checking and casting blades are:

1. Any errors in airfoil contours are averaged out.
2. Blades are positioned, or cast, in a device which is easily handled and locked in suitable fixtures for all machining operations.
3. Relation of airfoil to root is assured.
4. The airfoil cannot be distorted by holding fixtures when performing machining operations.
5. Subsequent machined surfaces can be easily gaged from the same locating surfaces used for machining with assurance that all portions of the bucket are in proper relationship to each other.

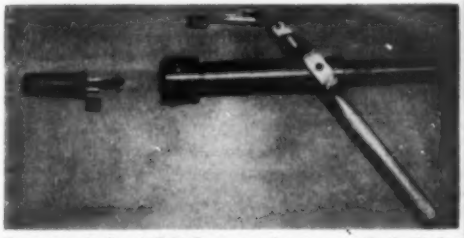


Fir-tree pattern on comparator screen after grinding. Master outline on screen shows degree of accuracy maintained in form grinding

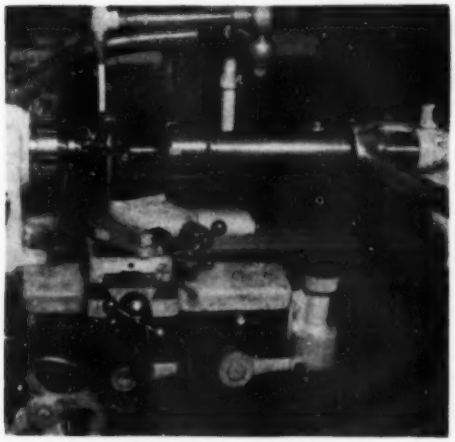
Toolroom Conversion Produces Semi-Turret Lathe

SIMPLE ADDITIONS to a conventional engine lathe, made at Craig Air Force Base, saves $0.14 per bolt or stud produced at a total initial cost of only $325. Future savings are estimated at $1000 a year.

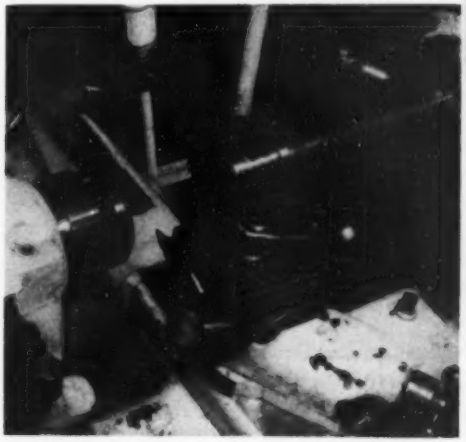
The lathe is a 10-in. South Bend bench model. Cutting threads was previously done with a single-point tool which had to make a number of passes at each stud. The new rig, however, produces a finished thread with one pass. Cutoff is faster, too, with a blade held in the turret. Chucking is speeded by a lever-operated drawbar collet in the headstock; and all operations are improved by the coolant system, added at the same time as the tailstock equipment.



Components for tailstock conversion are easily built for most simple engine lathes. Link attaches lever to bracket added to tailstock casting. Drawbar collet (left) works with similar lever added to headstock



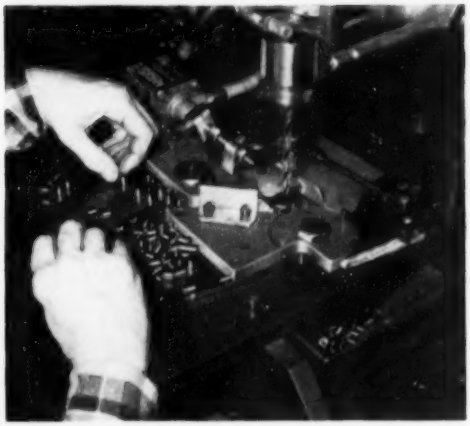
Lever-operated spindle was first addition to engine lathe. Diehead cuts threads straight on to almost any depth



Completed conversion job left engine lathe with square indexing turret on rest, pump under bed

6 "SHOP KINKS" BOOST OUTPUT AT DOUGLAS AIRCRAFT

BY W A NORDHOFF, Production Cost Analyst, DOUGLAS AIRCRAFT CO, INC, Santa Monica, Calif

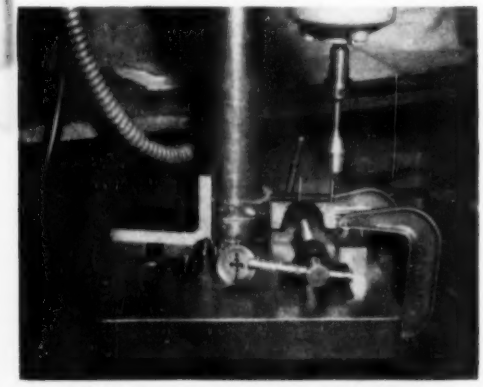


1. BURRING FIXTURE BOOSTS OUTPUT 160%

This small and compact tool—operated with a drillpress—increased the production of burring small spacers and bushings from 250 to 650 parts per hour. Prior to development of this production aid, the operator held the parts by hand. From time-to-time the burring tool would grab. The part then would slip in the operator's hand causing severe cuts from sharp edges. Next, a pair of pliers or a small drill vise were used. However, these methods also were unsatisfactory because of the relatively long time required to position and hold the part with the pliers or vise.

The fixture illustrated eliminates the unsatisfactory conditions mentioned and incorporates the best motion-economy principles in its design. Both of the operator's hands are free for useful work and the principle of drop delivery is employed. Actual manipulation of the drillpress now is performed by the operator's foot.

The operation is: The hands position the parts in a guide. An airstream moves the parts to an air-operated chuck. Sensitive pedal feed is obtained through cable linkage to the feed lever. The feed-lever shaft passes through an air valve fixed to the body of the drillpress and controls the air cylinder near the operator's left hand. When the operator presses the pedal, the cylinder automatically closes a vise and holds the piece as the burring tool (an oversized drill or a burring reamer) advances to the work. The operator continues to push on the pedal until the tool advances far enough to burr the part. When the operator removes pressure from the pedal, spring-tension returns the feed lever to the rest position. Simultaneously, the air valve exhausts the cylinder, opening the vise. A cam mechanism ejects the part, which drops into the pan below. The lever (right center) actuates the disk (foreground), which acts, first, as one jaw of the vise, and, second, as the ejector mechanism. A trip dog permits a spring to return the disk to the start position.



2. BUTTON DIE ON TAPPING ATTACHMENT DOUBLES PRODUCTION

Before Douglas thought of threading with a button die on a conventional tapping attachment, small U-bolts presented a difficult external threading problem. On some bolts, it was not possible to thread both ends before bending because the bending dies would mar the threads. On others, the bar stock would be heated, flattened in the center, and then formed. Heating would ruin a precut thread.

Initially, the threading of both stems of the bolt was planned as a turret-lathe operation, using a lathe fixture and a self-opening threading die. This did not work, however, because of interference as one stem rotated around the other. It then was necessary to go to a small button die. This compelled the turret-lathe operator to reverse the spindle to clear the die. It also was necessary to reposition the part in the fixture to thread the other stem. In all, too many operations were performed and too much time was required.

Now the operation is performed on a drillpress with a standard tapping attachment and a small button die. Instead of using a fixture, the bolt is held in a small drill vise. The thread on one stem is cut, the vise repositioned, and the other thread cut. The button die automatically centers the part, and the attachment automatically reverses on the way out.

This method results in a time saving of better than 50%. In addition, it utilizes low-cost equipment, and a lower-skilled operator performs the work.

Improvements in machine-shop practice often are not revolutionary. But the steady development of better methods of performing everyday shop operations adds up to appreciable savings over the long run. Here are six setups developed at Douglas to solve problems and increase production on operations common to many shops

3. FIXTURES DOUBLE DISK-GRINDER OUTPUT

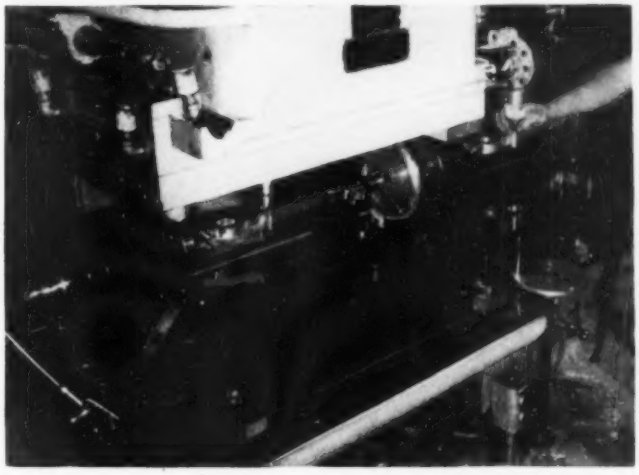
Many castings, forgings, and torch-cut parts require some cleanup of at least one of their irregular surfaces. This operation often is performed on a disk grinder. The ground surfaces then become bearing or locating points in subsequent machining operations. Parts ground in this manner formerly were held by the bare hands of the operator. If much material was removed, parts became too hot to handle. Awkward parts also were hard to hold. Where angles and dimensions were to be maintained, the operator required a guide of some sort in the form of a holding fixture. For some reason, however, this tool never received official recognition in the shop. No one seemed interested in making a holding tool to facilitate the work of the disk-grinder operator.

So he fashioned his own fixtures, as the need arose, out of scraps of wood from the pattern shop. His tools were a hammer, a chisel, a pocketknife, and imagination. The fixtures are attached to an angle knee on the disk-grinder table. The pattern carved into the wood neatly nests the part and securely holds it during the operation. The time required to make such a fixture varies from ½ to 2 hr depending on the complexity of the part to be held. Although these are "illegal" tools, they are identified and stored for future use. The production of disk-ground parts has been doubled because an operator in one of the lower machine-shop skills took a real interest in his work.

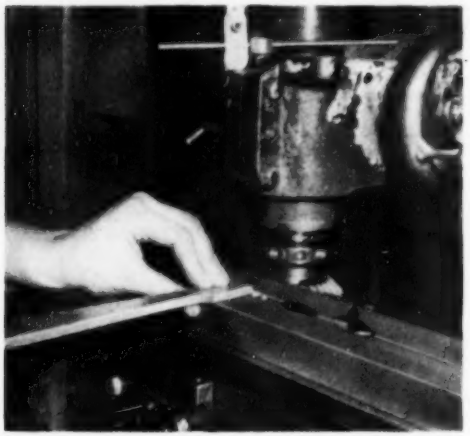
4. SPECIAL DUPLICATOR WORKS AT ANY ANGLE

When work commitments require complex parts and a deadline delivery date cannot be met by the foundry, Douglas solves this problem by duplicating the pieces from solid bar stock. The job is performed on a Douglas-developed high-speed duplicator—a modified form of the die-sinking machine.

A wood pattern of the piece is made and is fixed in its proper position on the machine. A solid bar of material is also installed in its proper place. A hydraulically functioning stylus which operates by finger-tip control moves along the contour of the pattern through three dimensions and transmits its movements to a high-cycle (15,000-rpm) milling head which uses special polished fluted end mills. The contours of the pattern are transmitted to the bar stock in this manner. The pattern and the material can be rotated a full 360° and work can be performed at any angle within this rotation. This faithfully reproduces the pattern.



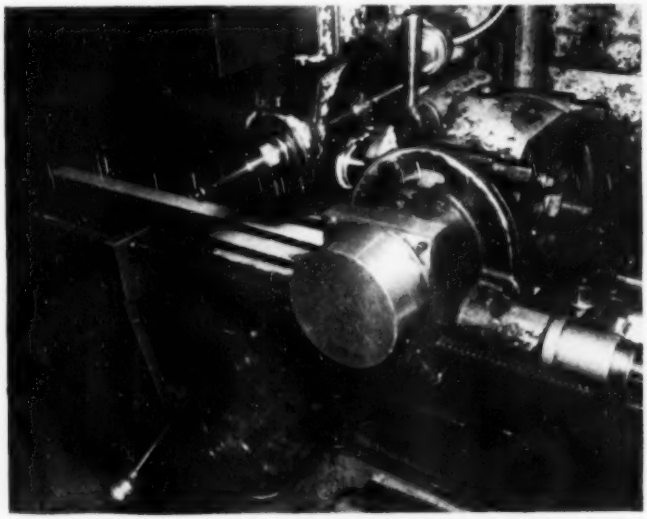
The average piece can be duplicated in less than one-half hour. Subsequent machining operations are less on a duplicated part because the pattern and the duplicator will ignore conventional draft angles which later might need to be machined were the part made from a forging. Many machined surfaces are finished to drawing dimensions during the duplicating process. Surface finishes are well within the natural surfaces produced by the foundry. The method is also useful for experimental manufacturing.



5. WOODWORKING TRICK MILLS CHAMFERS 300% FASTER

One day a milling-machine operator turned in a performance of 400% on a time-studied standard. The operation was "Mill 45°x1/16 chamfer". Here's how the standard was beaten: The operator reached out into the woodworking industry and brought one of its techniques into the machine shop. He designed an angle fixture with an opening in the center of the closed angle. This opening permitted a 45° angle cutter to protrude into the fixture the correct amount for the milling of a chamfer when the part was shoved along the angle of the fixture.

The old method (time-studied) was: Pick up part; position on mill table; secure part to table with one strap clamp; advance work to cutter; mill chamfer; clear work from cutter; release part from table; transport part to tote pan. The new method is: Pick up part; position against angle, shove part by hand along angle past mill cutter, and aside to tote pan.



6. AUTOMATIC INDEXING OF DIVIDING HEAD SAVES 86%

This mechanism was developed by Douglas Aircraft Co to obtain fully automatic indexing of a dividing head through any number of equal divisions of a circle. It has resulted in an 86.2% saving in indexing time.

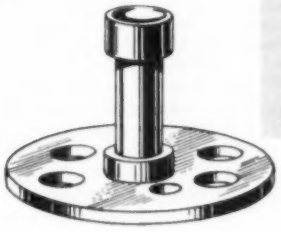
Automatic indexing of the dividing head is accomplished by a rack operating a gear which turns the dividing-head spindle any required number of degrees. The head indexes only during return travel of the mill table. A pawl and ratchet in the rack gear prevents any indexing during the machining element. The rack gear can be adjusted to index the dividing head any desired number of degrees. Two adjustable collars, mounted on a portion of the rack that passes through an arm attached to the body of the milling machine, provide this adjustment.

The collar nearest the rack teeth returns the rack to its start position while the machine is feeding into the work, but will not move the indexing head. The space between the collars permits return of the machine table to the start position and also permits the cutter to clear the work before the head is indexed. The position of the second collar determines the number of degrees the dividing head is indexed.

The device is attached to a semi-automatic mill which will rapid-traverse the table to work, mill, and rapid-traverse the table from work, and will repeat this cycle indefinitely and automatically until the machine is stopped by the operator. By the old, conventional method in which the operator manually indexed the dividing head, the time required for indexing and for rapid traversing to and from the work is approximately 0.0058 hour. The same cycle by the new automatic method requires 0.008 hr (3 sec). This saves 0.0050 hr per index cycle. On a 36-serration operation, the total time saved is 0.1800 hr or 10.8 minutes. This represents a unit saving independent of the machine time, which would be the same by either method.

The conventional manual operation requires the full-time attention of the operator. The automatic device outlined frees the operator to run two or more machines. Splines, serrations, or other tooth-forms are milled by this method. It also is used for milling evenly spaced flats such as hexagonal shapes. Indexing of 120°, 60°, 15°, and 10° is required on work normally run.

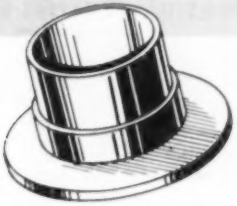
how to
MACHINE AND FINISH STAINLESS STEEL



Many shops now are machining stainless steel for the first time; others are handling new and unfamiliar grades. In all, more than 30 grades of stainless are available, each providing varying combinations of corrosion resistance, heat resistance, and high strength. Each also has slightly different machining characteristics. Tooling for stainless, therefore, requires not only a general knowledge of properties, but also specific information on individual grades.

To provide both, G J Stevens and V Bankoski, Rustless Division, Armco Steel Corporation, have prepared the machining section of this report — the third presented by AMERICAN MACHINIST on the working of stainless steel. Compared to the previous report, published in 1947 and now out of print, this one contains a more detailed discussion of those tooling methods and operating practices that solve problems most commonly encountered. Slanted directly toward the operating man, the report contains one section on basic rules governing tooling, machine operation, and cutting fluids, and a second section on specific operating tips for major metal-cutting operations. Based on actual shop experience, these rules and tips have cured many machining headaches and can do much to insure more and better production of stainless-steel parts.

The finishing of stainless steel also involves techniques that differ from conventional practice. In the third major section of the report, Lester F Spencer, chief metallurgist, Landers, Frary & Clark, summarizes latest thinking on finishing methods, including grinding, buffing, and polishing.



American Machinist SPECIAL REPORT NO. 315 TO THE METALWORKING INDUSTRIES

Copyright 1952 by McGraw-Hill Publishing Co., 330 W. 42nd St., N. Y. 36, N. Y.

Table I . . KEY CHARACTERISTICS OF THE STAINLESS STEELS MOST COMMONLY MACHINED

	AISI NUMBER	IDENTIFICATION BASED UPON COMPOSITION	BRINELL HARDNESS	MAJOR MACHINING CHARACTERISTICS
MARTENSITIC TYPES	410	12 Cr	180-240	Stringy chips. Not abrasive. Low work-hardening rate.
	416	12 Cr (FM)	180-240	Free-machining grade. Machines at speeds approximately 85% of Bessemer screw stock. Produces short brittle chips.
	420	*13 Cr—0.35 C	180-230	Grades have high hardness. Abrasive action on tools because of high carbon content. Carbide or high-cobalt cutting tools suggested.
	420 F	*13 Cr—0.34 C (FM)	180-230	
	440	*17 Cr—0.60-0.100 C	200-265	
	440 F	*17 Cr—0.60-0.100 C (FM) *(Annealed)	200-265	
FERRITIC CHROMIUM TYPES	430	17 Cr	170-230	Same as 410.
	430 F	17 Cr (FM)	170-230	Same as 416.
CHROMIUM-NICKEL TYPES	302	18 Cr-8 Ni (Annealed)	150-250	Widely used grade. Work-hardens, therefore tools must not ride surface without cutting. Grade is tough—heavy feeds, slow speeds, and chip curlers recommended.
	303	18 Cr-8 Ni (FM)	150-240	Free-machining counterpart of Type 302. Can be machined at speeds 75% of those for Bessemer screw stock.
	309	25 Cr-12 Ni	150-240	Grades with special properties for specific uses. Machining characteristics similar to Type 302. Some available in free-machining types.
	316	18 Cr-12 Ni Mo	150-240	
	321	18 Cr-10 Ni Ti	150-240	
PRECIPITATION HARDENING TYPES		17 Cr-4 Ni Cu Ph grades	300-360	Machining properties very similar to those of Type 410 in the hardness range of 280 to 320 Brinell. Also machinable in the hardened condition at reduced rates. Produces short, brittle chips and excellent finish.
		17 Cr-7 Ni Al Condition A (Solution treated)	150-240	

Table II . . APPROXIMATE CUTTING RATES WITH HSS TOOLS (fpm)†

OPERATION	AISI NUMBERS 410 430	416 430F	420 420F*	440 440F*	302 309 312 316 321 347	303	17-4 PH
Automatic screw machine**	90-100	120-150	80-100	60-80	70-90	100-130	60-80
Turret lathe**	80-100	100-130	60-80	50-70	60-80	90-120	50-70
Shaving or skiving***	90-100	120-150	80-100	60-80	70-90	100-130	60-80
Milling	40-60	50-80	30-50	30-50	40-60	40-60	40-60
Drilling	40-80	60-90	30-50	30-50	30-50	50-80	40-60
Reaming	15-40	15-40	15-40	15-40	15-40	15-40	15-40
Tapping	10-25	10-25	10-25	10-25	10-25	10-25	10-25
Threading	10-25	10-25	10-25	10-25	10-25	10-25	10-25
Broaching	10-20	15-30	8-15	8-12	8-12	10-20	10-20

†Cutting rates may be increased greatly with carbide tools, when applicable.

*Free-machining grades allow a minimum increase of 10% in cutting rates.

**Drilling, reaming, tapping, and threading operations are performed at the rates listed for each of these specific operations.

***Cast alloy or carbide recommended.

What are

STAINLESS STEELS are broadly classified into four groups: chromium-nickel types which have good ductility and cannot be hardened by heat-treatment but which can be given high strength and hardness by cold work; ferritic-chromium types which cannot be hardened by heat-treatment; martensitic types, which are chromium stainless steels that can be heat-treated to a wide range of hardness; and the precipitation-hardening types that combine excellent corrosion resistance, and high strengths and hardnesses, with low-temperature heat-treatment. Several of each type are shown in Table I.

Average Cutting Speeds

These and all stainless steels are machinable. But as they are special steels with high strength and unique properties, they often are considered difficult to machine. This is a misconception. Stainless is not difficult, it is merely different. Free machining grades can be machined at approximately 85% of the cutting speeds for Bessemer screw stock. Furthermore, shop experience and laboratory tests have shown how other grades differ in machinability and what their average cutting speeds are. These rates are listed in Table II.

Another misconception is that special tooling is required to machine stainless steel. In machining the regular grades, very few deviations from standard practice are necessary. The usual HSS or carbide tools for mild steel are satisfactory for the free-machining grades. In most cases, problems in cutting stainless can be traced to lack of familiarity with the characteristics of stainless, or with the proper cutting rates and tools. With only a little experience and a few fundamentals, no trouble need be

the rules for machining stainless?

encountered in machining stainless. The rules that follow have eased plenty of machining headaches and will prove helpful in planning setups on stainless jobs.

Which Tool Material Is Best?

High-speed steel, cast alloys, and carbides are all employed for machining stainless. Selection is governed by the machine, its capacity, and the machining operation. Table III gives recommendations for various cutting operations. To make a final selection, however, the tool engineer must take into consideration all factors affecting the job. For example, in turning at high speeds both cast-alloys and carbides give excellent results. If maximum cutting speed is desired and the machine is in good condition, with heavy, rigid tool supports, carbides are the best choice. However, if the tooling is subject to vibration because of overloading, cast alloys or high-speed steels give better results because of their greater resistance to chipping or cutting-edge breakdown.

Care should be exercised not only in the selection of tools, but also in their grinding. Unreasonably short tool life results from burning the tool in grinding or by failing to remove any microscopic cracks that may be present in a reground tool. It also is important to condition the tool to obtain a smooth cutting edge. This will increase tool life and improve finish, particularly in final operations.

What Size Machine Is Needed?

Stainless steel is a high-strength material. Consequently, it takes more power to machine stainless than it does to machine mild steel or non-ferrous metals. This means considerably greater loads on tools

Table III . . RECOMMENDED TOOL MATERIALS FOR THE MAJOR MACHINING OPERATIONS*

OPERATION AND TOOLS	TOOL MATERIALS				
	HIGH-SPEED STEEL	HIGH-SPEED COBALT	HIGH COBALT	CAST ALLOYS	CARBIDES
TURNING					
Low speed—heavy, or intermittent cuts	Exc	Exc	Good	Fair	—
High speed—medium or heavy cuts at moderate feeds	—	Good	Good	Exc	Exc
Finish Turning—light cuts at fine feeds	—	Fair	Good	Good	Exc
FORM TOOLS					
Heavy or light feeds at moderate speeds	Exc	Good	Good	Good	—
Medium or light feeds at high speeds	—	Good	Good	Exc	Exc
BOX TOOLS					
Heavy to medium cuts at moderate speeds—intermittent cuts	Exc	Exc	Exc	Good	—
Medium or light feeds at high speeds	—	Good	Good	Good	Exc
CUTOFF TOOLS					
Circular or blade types—					
Average setups—medium or heavy feeds—intermittent or heavy cuts at moderate speeds	Exc	Good	Good	Fair	—
Special setups—medium or fine feeds at high speeds	—	Good	Exc	Exc	Good
MILLING					
Average conditions	Exc	—	—	—	—
High production with adequately powered machines	—	—	—	—	Exc
DRILLING					
Average conditions	Exc	Good	—	—	—
Special applications, deep holes, etc	Good	Exc	—	—	Exc
REAMING					
Average conditions—medium to fine feeds at moderate speeds	Exc	Exc	Exc	—	—
High speed at medium to fine feeds	—	—	—	Good	Exc
TAPPING AND THREADING					
	Exc	—	—	—	—
Thread chasing (fast speeds)	—	—	—	—	Exc

*These general recommendations must be used with reservation because of variations introduced by type of equipment, special tool grinds, cutting rates, and setups.

toolholders and all machine parts.

Whenever possible, heavy equipment should be selected for machining stainless, particularly when the job is run at maximum cutting speeds. This does not mean large equipment, but refers to the relation between the machine load and the rated capacity of the machine tool. Any machine can be considered heavy if its loading does not exceed 75% of its rated capacity. For example, considerable quantities of non-ferrous materials are machined on automatic equipment, both single and multiple-spindle. These automatics are designed to machine such materials efficiently in diameters up to the maximum capacity of their spindles. However, conventional automatics designed to handle 1-in.-dia non-ferrous stock would be overloaded if used to machine 1-in. stainless bars or steel bars. In this case, the equipment would be light. But, if ¾-in.-dia bars were machined, the equipment would be considered heavy.

Machines for Tapping

An exception must be made in drilling and tapping. For small drills and taps, light equipment is necessary. If small drills are used in heavy presses with large spindles, the high speeds necessary for proper cutting rates usually cause vibration and poor drill life. Likewise, small taps in heavy machines are under severe strains because of the mass of large spindles and holders. Lead-screw attachments, however, largely eliminate this condition.

As high cutting pressures tend to accentuate troubles encountered from machines in poor mechanical condition, best results are obtained if stainless is machined on well-maintained equipment. This precaution applies not only to working mechanical parts but also to tool and workholding devices. Excessive play or insufficient rigidity are apt to result in poor surface finish, poor tool life, or in off-size dimensions.

Chatter and tool forces can be reduced with lower speeds and lighter feeds, but machine tools in poor condition will not be capable of capacity production. As a general rule, fine feeds should be employed on high-speed machines or light equipment, and heavy feeds on low-spindle-speed tools or heavy machine-tool equipment.

How to Select Cutting Fluids

Selection of cutting fluids for stainless steels is important. The tool pressures involved and the heat generated require a combination good lubricant and coolant. However, the relative importance of each of these factors varies with the type of operation and with the cutting speed and feed being used. As with any metal, certain basic recommendations can be given, but these must be modified by the tool engineer or operator according to the individual needs of the job.

In general, sulfurized or sulfachlorinated cutting fluids cut back with paraffin oil work best on stainless. Where cutting pressures are high and cutting speeds low, such as in threading, tapping, broaching, and rough turning, heavy mixtures are required. For light cuts, high cutting speeds, screw-machine work, drilling, and reaming, more paraffin oil should be added to give thinner mixtures.

The grade of stainless also affects the selection of a cutting fluid. The 18-8 types (302, 316, and 304) require a greater proportion of sulfur-base oil, while the free-machining grades (303, 416, 430F, 420F, and 440F) can be machined with much lighter mixtures.

Water-Soluble Fluids

Water-soluble cutting fluids, while not used as extensively as oil in machining stainless, can do an effective job on certain operations. As they are primarily coolants, they should be used where high cutting speeds and light cuts are employed. In such cases, tool failure may result from high cutting temperatures, hence good cooling is essential. Water-soluble fluids are particularly suitable for high-speed operation with carbide-tipped tools. But, to get maximum lubrication, use heavy mixtures.

If cooling the work is difficult, as much of the piece as possible should be placed in contact with the collet or chuck. The heavy masses of metal take a considerable amount of heat from the work by conduction. This hint is especially valuable on thin-wall sections with large machined-out areas.

Regardless of the cutting fluid selected, it is essential that the fluid flood both the tool and work. An ample stream of fluid should be properly directed at the cutting edge to secure maximum cooling and lubrication. As cutting fluids are essential to quality machining of stainless, standard precautions should be followed in their use.

Tips on Tool Design

As for other metals, the design of cutting tools and fixtures for stainless is mainly dependent on the type of operation and the requirements of the particular job. Specific recommendations are detailed in the discussion of major machining operations. However, there are general rules that apply to the cutting of all stainless steels.

Heavy, rigidly supported tools and toolholders will eliminate much apparent difficulty in machining stainless. Such precautions apply to the machining of most metals, but are particularly important on stainless because of the strength and toughness of the material. Many problems of chatter, poor finish, and low tool life can be eliminated by these simple precautions. For the same reasons the work must be as strong as the tooling. Unsupported sections should be as short as possible, particularly when taking heavy or wide cuts. Steadyrests or roller-and-bushing supports may be required to avoid deflection or vibration.

Cutting Tool Edges

Cutting tool edges should be as strong as possible. To reduce frictional heat, narrow lands and minimum but adequate relief angles should be used. Drills, and other tools where chips are confined, should have large clearance angles and chip spaces. In some drilling and tapping jobs, it may be necessary to use chip breakers, high-helix-angle drills, or gun-point taps to facilitate chip removal.

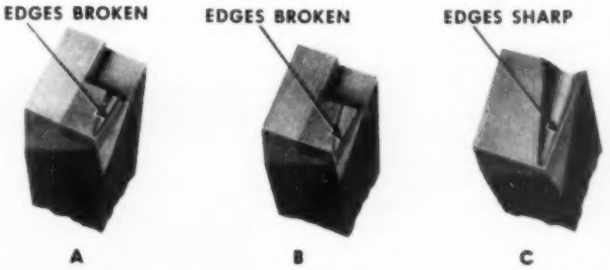
As chromium-nickel and some chromium grades produce stringy

chips, either chip breakers or curlers are needed. This is especially true on turret lathes and other equipment where long, continuous chips interfere with operations. For medium or light cuts, a chip breaker is recommended, especially on carbide tools; for heavy cuts, particularly with chromium-nickel steels, a chip-curler grind works well.

In every case, cutting tools must be kept sharp. Down-time is expensive, but it can be reduced by regular and careful tool grinding. Close attention should be paid to wheels and grinding techniques. Often a slight additional expense in grinding wheels, adequate lighting at the grinder, or a little more care in grinding can mean more efficient use of costly machine tools. Cutting edges, especially on carbide tools, should be stoned after grinding. Stoning removes microscopic rough edges which break easily and shorten tool life.

Tips on specific machining operations

EXPERIENCED tool designers or operators usually can apply the general recommendations given thus far to machine the majority of stainless steels without difficulty. But there are many "rules of thumb" that apply to specific operations and that can be utilized to avoid troublesome problems. The most important of these rules—all based on experience in the field—are outlined in the following sections.

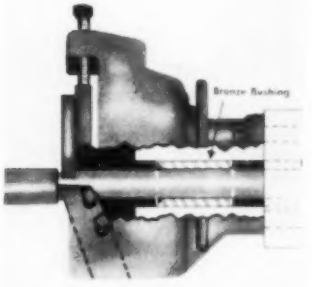


CHIP-BREAKER grind A is recommended for carbide box tools, chip-curler groove B for HSS. Chip-curler in carbide tool C should be modified by honing cutting edge

Box-Tool Turning

As the box tool is standard equipment on automatic screw machines and turret lathes, it is utilized extensively in turning stainless. For most efficient use, the box tool must be ground for ease of chip removal. A chip-curler grind gives good results and is satisfactory for heavy depths of cut.

High-speed tooling operated at conventional speeds and feeds is recommended. High-cobalt steels (5 to 10%) or the high-cobalt alloys permit increased cutting rates but require lower depths of cut to avoid tool chipping. Carbides also are employed but usually require further reduction in depth of cut in comparison with HSS or cast-alloy tools at comparable feeds. A reduction of feed, on the other hand, will permit heavier depths of cut. For example, when using a box tool of ¼ to 1 in. capacity on a turret lathe, a 1-in.-dia bar would be turned with a HSS tool at ¼ in. depth of cut and 0.007 ipr feed. (Chip-curler grind on tool.) If a carbide tool were substituted, under similar conditions, depth of cut would be reduced to ⅛ in. maximum, unless the feed were also reduced. Carbide tools, however, permit higher turning speeds (sfpm).

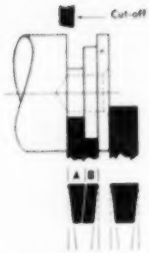


BUSHING IN BOX-TOOL supports bar when long sections must be turned

Table IV . . RECOMMENDED CUTTING SPEEDS FOR SINGLE-POINT TURNING

TOOL AND OPERATION	AISI NUMBER PH GRADES	410 430	416 430F	420 420F*	440 440F*	302	303
			FPM				
CARBIDE TOOLS							
Roughing	130-180	150-200	150-200	100-150	100-150	130-180	150-250
Finishing	150-300	200-400	200-400	150-250	150-200	150-300	200-400
HIGH COBALT TOOLS							
Roughing	100-130	100-130	100-150	80-100	60-80	100-130	100-150
Finishing	100-150	100-150	150-200	100-150	80-100	100-150	150-200
HIGH-SPEED TOOLS							
Roughing	60-90	80-100	80-100	60-80	40-60	60-90	70-90
Finishing	100-120	80-130	100-150	80-120	60-80	100-120	100-140

*Free-machining grades allow a minimum increase of 10% in the cutting rates shown.



SPLIT FORM TOOLS permit effective side clearance. Loss of size at A after grinding can be compensated by moving cutoff blade

Table V . . RECOMMENDED FEEDS FOR TURNING

OPERATION	TURRET LATHE	AUTOMATIC SCREW MACHINES		
		HEAVY-DUTY FEED (IPR)	LIGHT	SWISS AUTOMATICS
BOX TOOL				
Rough	0.005-0.015	0.005-0.010	0.002-0.005	—
Finish	0.003-0.010	0.003-0.005	0.002-0.005	—
FORM TOOL				
Rough	0.001-0.003	0.001-0.003	0.0003-0.001	—
Finish	0.0005-0.001	0.0005-0.001	0.0002-0.0004	—
CUTOFF	0.0005-0.0025	0.001-0.003	0.0005-0.001	0.0002-0.0003
SINGLE-POINT TOOL				
Rough		0.005-0.015	0.0005-0.0015	0.0005-0.001
Finish		0.003-0.010	0.0005-0.0015	0.0005-0.001
SHAVING	—	0.003-0.005	—	—

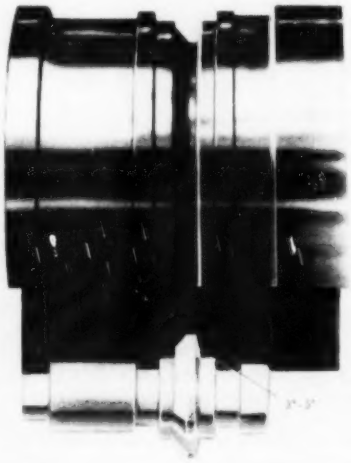
When box-turning long sections, the work may bend or distort, especially under heavy feeds or deep cuts. To avoid this, final adjustments for sizing the box cutter should be made on a turned section close to the spindle head to insure correct alignment. A bronze bushing should be added to the box tool or turret to guide and support the stock during the turning operation.

Single-Point Turning

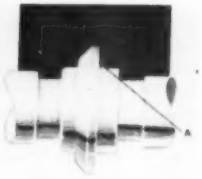
Single-point turning of stainless is performed with carbide tooling in most instances. Tools are ground with the same standard-rake angles that are used for alloy steels. However, when turning large sections, vibration and chatter break down carbides rapidly. If this occurs a tougher grade of carbide, a cast alloy, or HSS should be selected. Tools must be ground with high rake angles and run at reduced speed. This will prove more efficient in the long run, however, as depth of cut and feed rate both can be increased. Whenever possible, the carbide toolbit and holder should be double the size required for HSS or cast-alloy tools. This provides added resistance to shock and better heat dissipation.

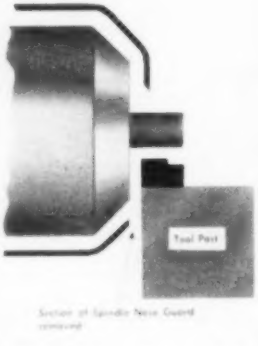
When Can You Use Form Tools?

HSS, cobalt steel, or cast alloy is the usual selection for the general run of forming jobs. Carbides, however, are used for certain types of forming operations on single- and multiple-spindle equipment on large production runs. Special

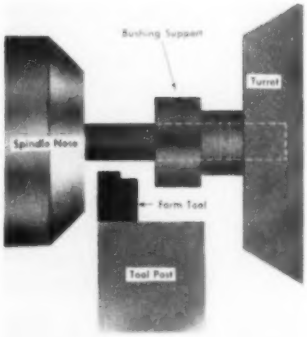


MODIFIED CIRCULAR FORM TOOL (left) has 3° to 5° relief angle to give longer tool life. Tool without relief will pick up and wear rapidly at A, requiring considerable grinding to sharpen





FORM TOOLS should be close to spindle even if part of guard must be removed



BUSHING SUPPORTS reduce deflection when forming long pieces

grades of carbides are selected and modified feeds are employed. While increased cutting rates can be obtained with carbides, their greatest asset on single- and multiple-spindle equipment is less downtime for tool regrinding. Specific recommendations are in Table III.

Limit Form-Tool Widths

On automatic machines and turret lathes, chromium free-machining types (such as 416 and 430-F) form satisfactorily and do not require special tooling. The easiest stainless to form is type 303, a chromium-nickel steel with free-machining addition. However, the other chromium-nickel types (302, 304, 316 and 321) should be turned whenever possible. If it is necessary to form these materials, form tools should be rigidly supported, cutting speeds decreased, and tool width should be limited to 1½ times the stock diameter. If wider forming must be done, split form tools should be provided. These permit helpful side clearance angles and adjustment for part size after regrinding. Initial forming can be followed by a finish form-, shave-, or skive-tool operation.

Rules For Form-Tool Design

In all forming on stainless, consideration of the following factors will prove helpful:

Avoid wide form tools, if possible. Tools wider than 1½ times the stock diameter require rigid support to prevent excessive chatter and must be given light feeds, particularly on hexagonal stock. However, these wide forming jobs should be done with split form tools, if possible.

Form tools should be designed to compensate for lack of side clearance. The modification illustrated does this and also balances the end thrust on the spindle bearings. In addition, it prevents galling and seizing at "*A*" (accompanying drawing) and is beneficial after deep forming cuts. On multi-spindle machines, a shave tool removes the excess metal left by the modified form tool.

Sharp corners, particularly in roughing stainless, should be eliminated whenever possible on all form tools.

Form tools should be mounted close to the spindle, even if it is necessary to cut away part of the spindle guard. This is especially important for small-diameter stock.

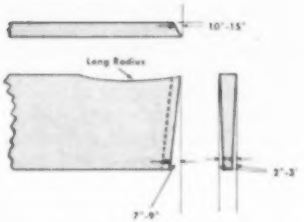
When forming long pieces, a support close to the form tool increases its effectiveness.

Top rake angles influence the shape of a formed part. While 5 to 10° rake angles are recommended for stainless, the tool must be designed to incorporate these angles.

Cutoff Tools

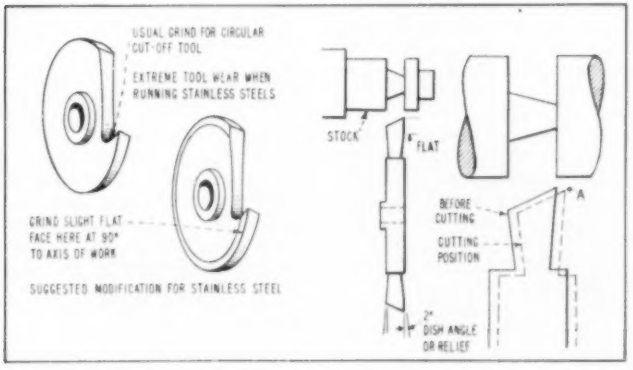
Cutoff tools for stainless are made of HSS, high-cobalt steels, cast alloy, or carbides. Selection is covered in Table III.

Cutoff tools usually are designed slightly heavier than those for nonferrous metals and mild steel. Recommended angles are shown in an accompanying illustration. The 10 to 15° end cutting edge angle facilitates chip removal and is suitable for small work. As the size of the piece increases, this angle can be reduced to 5° to avoid deflection of the tool and a resulting change in dimension of the piece. Side cutting edge relief, or clearance, is 2° to 3°. An end clearance angle of 7° to 9° is recommended and a suitable back rake angle can be provided by grinding a long radius in the tool.



RECOMMENDED ANGLES for straight cutoff tools for stainless steel

A modified grind for circular cutoff tools should be employed to reduce wear on the cutting edges. As shown in an accompanying illustration, the front relief angle causes the tool under stress of cut to move to the right. This puts extreme pressure on point *A* and causes rapid wear. To offset this condition, a small flat is ground on the tool at 90° to the axis of the work. This flat takes the load and stands up much better than the conventional grind. As the tool deflects to the position indicated by the dotted lines, there is at least 1 or 2° side relief during the cut. When cutting off long sections, a full or half support bushing will help to reduce heavy cutoff nibs.


USUAL GRIND FOR CIRCULAR CUT-OFF TOOL
EXTREME TOOL WEAR WHEN RUNNING STAINLESS STEELS
GRIND SLIGHT FLAT FACE HERE AT 90° TO AXIS OF WORK
SUGGESTED MODIFICATION FOR STAINLESS STEEL
STOCK
FLAT
A
BEFORE CUTTING
CUTTING POSITION
2° DISH ANGLE OR RELIEF

FLAT GROUND ON CIRCULAR CUTOFF TOOL increases life of tool. During cutoff, tool deflects, providing 1 or 2° side relief. Conventional grind wears rapidly

Drills and Drilling Practice

Drilling operations on stainless steels can be performed efficiently with the application of a few basic rules. Factors that must be considered are: size of drill in relation to depth of hole; size of drill in relation to feed; chip removal in relation to drill jigs; and drilling

speeds in relation to drill size.

Stainless requires only slight modifications of standard drills. For most applications the drill point should be flattened to an included angle of approximately 130° to 140°. The web should be thinned to reduce cutting torque and excessive frictional heat. A land ground on the cutting edge of small drills will strengthen the edge. On large drills, a chip-curler groove will reduce cutting torque and assist in chip elimination.

MODIFIED GRINDS improve performance of standard drills. On drill (left), land 0.010 to 0.062-in wide at 7° strengthens cutting edges. Groove in drill (right) aids chip removal on automatics or jobs on which clogged chips overheat drills

Drilling Speed

Drilling speeds for the free-machining grades of stainless are only slightly less than those for standard carbon steels. They can be drilled at approximately 70-80% of the speed for mild steel. Recommended drilling speeds for specific types are listed in Table II. In actual practice, small drills usually are run slower than recommendations to prevent breakage.

Feeds for drilling stainless depend on the drill diameter and the depth of hole. The following feeds are recommended as a starting point, adjustments can be made as required: drills to ⅛-in. dia, 0.002 ipr or less; to ¼-in. dia, 0.004 ipr; to ½-in. dia, 0.007 ipr. Drills larger than ½-in. dia take correspondingly greater feeds; those smaller than ⅛-in., smaller feeds.

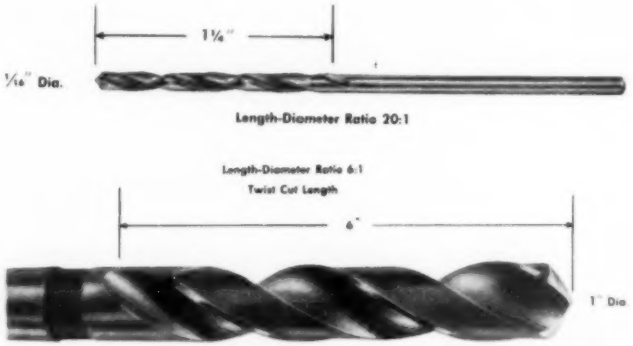
Power-fed drillpresses give far better results in drilling large holes than those with hand feeds because of positive feed control. Hand-fed presses are best with small drills, but a steady pressure on the drill must be maintained. Feeds can be extremely light but must be constant. Should the drill ride and work-harden the surface, subsequent drilling becomes very difficult, particularly on the chromium-nickel types of stainless. A vernier adjustment to reduce the one-to-one feed ratio between the drill and the feed control improves the operator's control of fine feeds.

Rules For Drilling

Here are basic rules on drilling stainless: In conventional drilling, the drill should be backed out to clear chips if the depth of hole exceeds 3 drill diameters. Back out the drill after an initial insertion of 3 to 4 drill diameters, after a second insertion of 1 to 2 diameters, and after subsequent insertions of ½ to 1 diameter. This rule is especially useful in automatic work. Where the drill size permits, a chip curler allows deeper penetration before backing out the drill.

Deep-hole drilling requires fine feeds to aid in removing chips. With small drills particularly, attention must be given to depth of penetration in relation to drill diameter. Any drilling job that is deeper than 7 drill diameters must be treated as a deep-drilling operation. Feeds and speeds must be reduced and crankshaft drills must be employed.

Drills should be as short as possible for utmost rigidity. This is especially important if breakage of small-diameter drills is to be avoided.



LENGTH TO DIAMETER RATIOS must be watched closely when drilling small holes in stainless. While ratio is good on 1-in.-dia drill, small drill is not sufficiently rigid

When using drills to enlarge previously drilled holes, such as in counterboring, cutting rates must be decreased as the outer edge of the drill is subject to higher cutting temperatures with poorer heat dissipation than in normal drilling.

In drill-jig design, the drill bushing should not be longer than twice the drill diameter. A clearance of 1 drill diameter should be provided between the drill bushing and the work. These two provisions greatly facilitate the elimination of chips. The drill bushing should not be used as a holding device, but the drill-jig design should incorporate adequate holding provisions.

Reaming

For general or short-run work on stainless steel, standard HSS, straight or helical fluted reamers

perform satisfactorily at speeds of 30 to 60 fpm. On production jobs, carbide-tipped reamers give better finish but should be operated at 150 to 300 fpm. These speeds may not be possible on automatic screw machines, but even though reduced speeds may cut down tool life, carbide reamers generally are more satisfactory than HSS reamers. Carbide-tipped reamers should have a 30° lead angle. Both types should have narrow lands.

A definite cut must be taken to avoid riding of the tool and burnishing the surface. About 0.003- to 0.010-in. should be removed at a feed of 0.003- to 0.008 ipr according to size of reamer. Too much lubrication may prevent proper cutting; consequently when reaming is difficult, thin the sulfur base oil with paraffin. Tapered holes requiring a fine finish should be bored rather than reamed for best results. If finish is not critical, taper reamers can be used.

Taps and Tapping Practice

Tapping practically any metal can present many problems. The free-machining grades of stainless steel are a tremendous help in tapping but it is important that recommended procedures be studied. Special attention to the selection, grinding, and use of taps is necessary with the regular chromium-nickel and high-carbon stainless grades.

Proper chip clearance is essential in tapping stainless. Therefore, in tap sizes up to No. 6, taps should be two-fluted; from No. 6 to ½-in. dia, three-fluted; and over ½-in. dia, four-fluted. Holes larger than 1-in. diameter can be tapped satisfactorily with collapsible taps.

The 10° to 15° hook, or rake angle, in standard taps gives good chip control and is satisfactory for stainless. To prevent taps from picking up a "bug" when backing out, the land should be ground away in back of the cutting edge. This also reduces torque and improves lubrication. Another method of preventing pick-up is to grind a positive angle on the heel so the tap cuts when backed out. Bottoming taps must have a short lead, but the lead must not be removed completely in shortening standard taps.

Gun or Chip-Driver Taps

Because of their strength, gun type or chip-driver taps with either straight or spiral flutes, should be used on stainless jobs wherever possible. As they direct the chips ahead of the tap, chip clearance is facilitated. They are effective on blind holes if sufficient chip room is available, but should have a flat ground on their cutting edges. This breaks chips and prevents clogging the hole.

Stainless has sufficient strength that deeply tapped holes usually are unnecessary. However, where they are required, the tap lands should be thinned by grinding away the heel, or else an interrupted-thread tap should be used. For the same reason a 50 to 75% thread usually will provide sufficient thread strength. Wherever possible avoid threading more than a 75% thread. If sufficient thread engagement is provided (usually 2 times the diameter) a 50% thread will be satisfactory. Reduced thread depth makes tapping much easier and increases tool life.

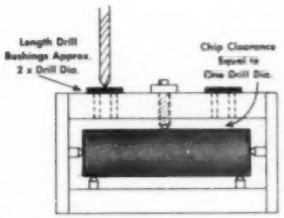
When tapping stainless steels to close tolerances, tapping equipment must be suitable to the job. Oversize or heavy equipment may be subject to lag or drag in the spindle and holder, with consequent loss of lead and thread surface finish. Well-designed holders, proper alignment, and a lead-screw attachment not only improve accuracy but also increase tool life. With old equipment on which alignment is a problem, floating holders have proved helpful. All taps should be precision-ground. In many cases, a rough and finish tapping operation is necessary. During roughing, the size of the thread should be held close to insure accuracy in finishing. The same is true of precision threading.

Lubrication has a very marked effect in tapping stainless. Adequate amounts of cutting fluids are necessary with the type depending on the job. High-pressure lubricants usually are required. Sulfur-base oils are recommended for coarse threading jobs; sulfur-base oil cut back with paraffin for fine threads or finish cuts; and white lead when trouble is encountered, usually on heavy cuts or full threads.

Threading

All grades of stainless can be threaded satisfactorily. Self-opening die heads generally are used for production threading and solid adjustable heads on small-diameter stock. Slow threading speeds are recommended for all stainless grades; 5 to 10 fpm where best finish is required; 10 to 20 fpm for National coarse, tapered pipe, and Acme threads; and 15 to 25 fpm for National fine threads.

Properly ground, all types of thread chasers can be used. Recommended grinds for best results



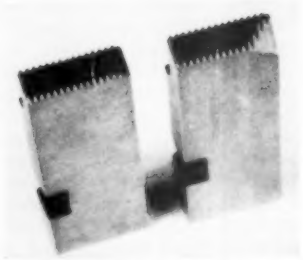
DRILL-JIGS FOR STAINLESS should have short bushings and provide ample space for chip clearance to avoid packing or jamming

CLEARANCE back of cutting edge as shown at right prevents pickup and permits better lubrication during tapping

FOR BLIND-HOLE TAPPING, a flat ground on the cutting edge prevents chips from clogging in the hole

Table VI . . STANDARD CHASER GRINDS

TYPE OF HEAD	410 403 431 430 446	420 420F 440A 440B 440C 440F	302 304 309 321 347	416 430F 303 PH GRADES
Tangent	20°-28°	15°-20°	20°-28°	10°-20°
Circular	20°-25°	15°-20°	20°-30°	20°-25°
Inserted or Milled	10°-12°	10°-12°	10°-12°	7°-10°
Hobbed or Tapped or Solid	10°-15°	7°-10°	10°-15° or hook	7°-10°



STEEP CLEARANCE on chaser at right permits better lubrication and reduces pickup. This is for fine-pitch threads

on various grades are shown in Table VI. A chamfer of approximately 20° insures good cutting action and clean threads, while a clearance angle, or relief, back of the cutting edge permits better lubrication and prevents pickup on fine-pitch threads. Keep die heads in proper alignment; in some cases, an adjustable holder will permit correct alignment.

Chasers should be kept sharp by grinding at regular intervals. This insures best surface finish and good tool life. In addition, as cutting pressures are high, the correct cutting fluid must be used. Coarse threading requires a heavy mixture of sulfur-base oil, but thinner mixtures containing more paraffin oil work best in fine threading.

Tangential chasers, because of their high rake angle (20°), usually are selected for cutting National coarse or Acme threads. Cutting these threads exerts tremendous pressure on die heads. Consequently, when working stainless it is advisable to keep well under the rated capacity of the head. A good rule is never to exceed 50% of its capacity. Under average threading conditions this value may be raised to 75%. Large chasers not only resist cutting pressures but also help in conducting heat from the cutting area. Larger chasers, therefore, hold up much better than small ones. These suggestions do not apply to fine threading.

Extremely accurate or highly finished threads, such as required for instrument parts and the like, should be produced by thread grinding or milling.

Milling-Setups and Feeds

Best results are obtained with heavy equipment. Large diameter cutters can readily exceed the capacity of most mills; consequently depths of cut and feeds must be limited. Rigid tools, large stub arbors, helical mills, and other devices to reduce vibration help in milling stainless. Climb milling is advantageous because the cutting forces are directed downward into the machine bed. However, it should be used only when the machine is equipped with a backlash eliminator or hydraulic feed. These prevent the cutter from pulling the work forward and thus avoid a condition which results in excessive chip loads and cutter breakage.

Feeds are largely determined by the available horsepower, but should be held to a minimum of 0.005 in. per tooth for roughing and 0.003 in. for finishing. A good rule is to favor low spindle speeds while using heavy table feeds. Carbide mills can take heavy feeds but the increased cutting rates they make possible cannot be fully utilized except on modern, heavy-duty, adequately powered machines. End mills should be as short as possible for top rigidity.

A heavy circular section of cast-iron or steel mounted on the arbor adjacent to milling cutters for side cutting or straddle-milling will prevent cutter deflection, have a flywheel effect, and permit increases in table feed.

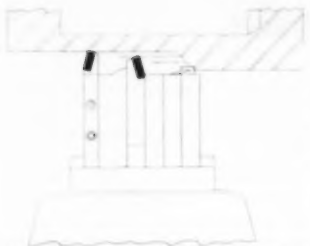
The use of negative rake for carbide milling cutters usually is determined by the type of cutter and by the operation to be performed. It is particularly helpful when impact cutting is involved. Negative rake tends to direct the cutting forces into the cutter-body, thus taking advantage of the high compressive strength of the carbide. In some cases, a slight negative rake or land is used instead of a full negative rake. This land usually is not much larger than the rate of feed per tooth.

Step Milling

The step mill with carbide-tipped cutters is effective and economical on stainless-steel pieces in both large and small lots. Step mills are modified face mills with inserted tools. Cutting edges are set at progressively greater depths so only one tool takes the final finishing cut. The step mill is designed for deep cuts at relatively low feed per revolution. However, with the higher spindle speeds possible with carbide tools, table movement is fast and large volumes of metal are removed at considerable depth.

Boring, Planing, and Shaping

Boring, planing, and shaping operations usually are performed on large sections, such as forgings and castings. Bars for internal boring should be as heavy and rigid as possible. Diameters should be as large as proper chip removal will permit. If slender, the bar should be piloted. If piloting is not possible, HSS cutters should be used in place of carbides or cast alloys. Boring speeds are similar to those for single-point turning.



STEP-MILLING with carbide-tipped cutters takes heavy cuts at reduced table feeds. As only one blade cuts on one plane, chip load is calculated on one cutter instead of four

Planing speeds for HSS average 25 to 40 sfpm, according to the depth of cut. For cast alloys, the range jumps to 40 to 65 sfpm, and for carbides is 125 to 200 sfpm. Shaping operations can be set up within the same ranges.

Broaching

Broaching is a highly specialized method of internally or externally removing material to very precise dimensions. If the part lends itself to this type of operation, considerable time can be saved over conventional milling or shaping.

Broaches are carefully designed to permit sufficient chip clearance in the allotted tooth space. This is done to prevent the spiral shaped chip-curl from overloading the tooth space and causing rapid broach wear or tooth breakage. The size of the tooth space is governed by depth of cut, type of material, and length of broach. As broach cost is determined by broach length, this factor must always be considered. The type of material and its hardness also play an important part. Soft materials usually form a larger spiral and are more difficult to broach than harder materials. Consequently, a broach must be designed for a single type of material and specific working conditions.

While the hardness ranges for broaching stainless are critical, stainless has been broached at hardnesses as high as 35 R_c. The average hardness range for best broaching of stainless is 200-240 Bhn. A good sulfur-base oil carefully selected for the specific operation is recommended for a lubricant. However, a water-soluble oil has been used successfully on a slab-broaching operation with a decided improvement in broach life. (Type 403 turbine-blade material similar to Type 410). Approximate broaching rates are listed in Table II.

Power Sawing

As a general rule, little difficulty is encountered in sawing stainless steels. However, because the nickel-chrome alloys have a tendency to work harden, a positive feed must be used and at no time should the saw blades be permitted to ride over the material without cutting. Failure to follow this precaution results in rapid dulling of the saw and unnecessarily short saw life.

Power hacksaws are used on 1 to 6 in. sections and are operated at 60 to 100 strokes per minute. Best results are obtained with a blade having a pitch of 6 teeth per inch. Increase blade pressure with free machining types of stainless. For sawing thin sections under 1-in. dia, blade pitch should be finer to permit engagement of at least two teeth in the cut. Either sulphur-base or water-soluble oil is satisfactory.

The power band saw can be used both for cutting contours in stainless sheet and for blanking and trimming work that otherwise would require expensive dies. In low-speed sawing, teeth must be very sharp and, because of the work-hardening characteristics of the chromium-nickel types, the saw must cut at all times to avoid shortening saw life unnecessarily. Coolant is helpful on thick sections but not on the lighter gages. Friction sawing is very successful on thicknesses up to ¼ or ⅜ in. Radii as small as ⅛ in. can be cut. Operating data for both types of sawing are listed in Table VII.

General Recommendations

Experience gained in the machining of stainless during the past several years when applications have greatly increased provides the data needed by shop men to avoid trouble on stainless jobs. The first thing to do in setting up a stainless job is to check the characteristics of the grade being run. Knowing these, the right tool material for the operation can be selected. Angles, speeds, and feeds can be determined using listed recommendations as a guide.

When the first pieces are run, the things usually watched in setup will provide a tip-off as to what must be done to get top results. These include the action of the tool during the cut, the finish produced on the work, and the condition of the cutting edge.

The condition of the machine itself and the rigidity of the setup must be regarded as critical in the results that can be obtained. Coolant selection also is essential to quality machining of the stainless steels.

Table VII . .
OPERATING RECOMMENDATIONS FOR SAWING STAINLESS*

	SHEET THICKNESS (in.)	SAW PITCH (TEETH PER INCH)	SAW SPEED (FPM)	CUTTING RATE (SQ IN/MIN.)
LOW-SPEED SAWING	Under 1/16	24-32	100-150	2.50 -400
	1/16	24	100	1.00 -2.50
	¼	14	75	0.75 -1.00
	1	10-8	50-75	0.50 -0.75
	3 and over	8-3	50-75	0.107-0.50
				(lineal fpm)
HIGH-SPEED SAWING	1/16	18	3000-6000	120
	⅛	14	6000-9000	75
	¼	14	6000-9000	55
	½	10	9000-12000	20
	¾	10	12000-15000	10
	1	10	12000-15000	6

*Standard or buttress saw, 3/16 to 1 in. wide (use as wide a saw as possible for radius cutting); 0.042 to 0.065 in. set, depending upon saw width; saw temper A.

Finishing Methods

RESISTANCE to heat and corrosion is a feature of the various stainless steels, the corrosion resistance being attributed to the formation of an oxide film on the exposed surfaces. It has been established that a definite relationship exists between the chromium content and the ability to form and maintain this protective oxide film under a given set of corrosive conditions. Thus, approximately 12% chromium has been found sufficient to promote and maintain an oxide film under normal atmospheric conditions. As the conditions of service becomes less oxidizing, it is necessary to have higher percentages of chromium to promote the protective film. However, as the chromium is gradually increased, resistance to corrosion does not increase gradually but occurs abruptly at the chromium content sufficiently high to allow the formation of the film. The addition of nickel to the base composition, as exemplified by AISI type 302, increases the stability of this protective film and renders its formation easier.

Stainless-steel compositions fall into three individual groups; ferritic, austenitic and martensitic types. The full corrosion resistance of the martensitic group is not realized until the material has been hardened. However, one of the more important factors to consider is the surface condition of the material. Thus, to obtain maximum corrosion resistance of any of the stainless steels, a clean, smooth surface, free from surface imperfections and foreign matter, is a prerequisite.

In surface finishing procedures, the preparation of the surface to obtain this maximum corrosion resistance is realized; other benefits would include pleasing appearance for the consumer trade, and dimensional accuracy on machined parts.

Basic Procedure

With stainless steels, a new approach must be made in regard to procedures. Handle grinding or polishing with considerable care, as the thermal conductivity of all stainless steels is low and their frictional qualities are high. Overheating and scorching are likely to occur, and the latter often impairs the corrosion resistance. The high coefficient of expansion exhibited by the austenitic group will cause buckling and distortion if the work is overheated in finishing. In many cases, it is recommended that cooling periods be interspaced between finishing operations. Both martensitic and ferritic grades are sometimes difficult to polish because of their galling and scoring tendencies. The surface of the polishing wheels tends to load and produce objectionable scratches. Dress the wheels frequently, and take time to produce the finish desired.

Pressure

Pressure should be as light as possible, and never greater than that necessary to cut efficiently. Remember that the time necessary to produce a given finish cannot be shortened by increasing the pressure on the wheel, as this will lead to overheating, buckling, distortion and defective finishes. Localized heating may also be experienced if the wheel is permitted to ride too long in a specific area; avoid this by continual movement of the wheel over the area to be ground. Where parts have been previously submitted to operations which produce a scaling condition, grind deep enough to remove all traces of scale and decarburization. Any pits that may remain will undoubtedly contain oxide and will be potential seats of corrosion. An electrolytic action is very likely to occur in service and may spread over the entire surface.

For removing weld beads, portable grinders are frequently employed; however, heavy initial cuts are sometimes made with cutting tools. The procedure suggested by Allegheny-Ludlum is: For initial grinding, employ hard rubber wheels of the bakelite-bonded types. They should be free cutting to prevent loading. Where the original bead is fairly rough, it may be desirable to start with a roughing operation, using a hard, aluminum oxide wheel of approximately No. 20 to 24 grit. For some applications, this may be sufficient. To dress down the bead further, it may be necessary to employ a No. 40 or 60, or even finer grits. This second step should be taken when the application involves final matching with a ground and polished surface.

It is advisable to change the direction of grinding with each change of grit size, but in many instances this may be quite difficult. Other factors to observe are the diameter and width of the wheel, as well as the weight factor. Where weld beads are to be matched, it is often desirable to finish the hard-wheel grinding slightly above the finished level, so final treatment for matching will not cause a groove along the bead. As an aid, stops or limiting lugs may be attached to portable grinding machines on either side of the wheel to limit the cutting to a predetermined point.

Take care to avoid contamination of the grinding wheels, particularly iron contamination. A general precaution is to reserve those wheels which will be used to grind stainless weld beads. Frequent dressing of wheels is important, as sharp corners and edges may cause deep scratches, especially where the wheels are canted in operation. Maintenance of concentricity is important from the standpoint of vibration. Cleanliness of adjacent alloy surfaces during grinding may be insured by protecting them with a coating of glued-on paper or other material.

In the production of parts from stainless bars, precision grinding is required to produce a perfect surface finish, exceptionally close dimensional and geometric accuracy, or where heat-treated parts are too hard to be cut by conventional methods. The grinding equipment, whether cylindrical, surface, internal, or centerless, should be rigid and constructed with materials that have a high damping capacity. Many grinding difficulties may be

attributed to either vibration or distortion.

Wheel Selection

The choice of wheel must be determined for each type of job and operation; normally this can be based on the experience provided by similar jobs, or by consultation with a reliable wheel manufacturer. Ordinarily, the austenitic stainless steels are quite gummy and should be ground with a wheel that has a relatively porous bond to avoid early loading. The straight chromium steels ordinarily can be ground with a harder wheel.

In centerless grinding, factors to take into consideration include blade material, wheel type, regulating wheel angle, guide adjustments, lubricant, and accuracy of setup. In regard to blade material, wear resistance is an important factor, and materials such as gray iron, Meehanite, high-speed steel, aluminum bronze and cemented carbide are often employed; the latter, although quite popular, must be used with caution when grinding stainless. Experimentation is often necessary to determine optimum conditions for obtaining a satisfactory finish; the amount of experimental work depending on the specific job.

One of the more difficult tasks is the centerless grinding of thin-walled stainless tubing. For example, an austenitic, type 302, stainless tube 2½ in. OD, 8½ in. long, and with a 5/32-in. wall thickness, was to be ground. Stock removal varied from 0.025 to 0.030 in. and the finished parts had to be straight and round within 0.005 in. and with a tolerance of 0.005 in. on the side. A rough grind was necessary. However, grinding could not be severe, otherwise distortion would occur. The carbide-tipped work blade for roughing caused some difficulty because small particles of stainless welded to the work blade and caused scratches and rings on the work. This was minimized by reducing down pressure on the blade by elevating it approximately ¾ in. above the center of the wheels, at which point objectionable chatter began. This did not entirely eliminate pickup, but the surface condition was greatly improved.

Considerable experimental work was required on such items as height of work blade, angle of regulating wheel, rate of feed, speed, and wheel type to determine the conditions necessary for maximum stock removal. Neither the free-cutting, rubber-bonded grinding wheel, nor the harder resinoid type came up to expectations because they broke down rapidly. In addition, the latter type glazed the work quite badly and resulted in out-of-roundness. The rubber wheel, however, was selected be-

RECOMMENDED WHEEL TYPES FOR GRINDING STAINLESS STEELS

OPERATION	TYPE	ABRASIVE	GRAIN SIZE	GRADE	STRUCTURE	BOND	BONDING VARIATION	BONDING PROCESS
FREE-MACHINING TYPES								
Centerless grinding		37C	46	M	5	V		Vitrified
Cylindrical grinding		37C	46	M	5	V		Vitrified
Surface grinding	Cupped	32A	36	G	8	V	BE	Vitrified
	Cylindrical	32A	36	G	8	V	BE	Vitrified
	Segmented	32A	601	E	12	V	BEP	Vitrified
	Straight	32A	46	H	8	V	BE	Vitrified
CUTOFF								
Dry, 12,000 to 16,000 sfpm		A	46	Q	8	B		Resinoid
Wet, 9,000 to 12,000 sfpm		A	46	V	8	R	30	Rubber
TUBE CUTOFF								
Dry, 12,000 to 16,000 sfpm		A	80	V	10	R	29	Rubber
Wet, 9,000 to 12,000 sfpm		A	80	U	10	R	29	Rubber
BILLETS AND SLABS								
Swing frame—7,000 to 9,500 sfpm		A	123	R	4	B	H	Resinoid
		A	16	V	8	R	30	Rubber
Portable grinders—7,000 to 9,500 sfpm		A	20	Q	4	B	H	Resinoid
		A	24	T	6	R	30	Rubber
HARDENED GRADES								
Centerless grinding		57A	60	L	5	V	BE	Vitrified
Cylindrical grinding		A	60	L	5	V	BE	Vitrified
CUTOFF								
Dry		A	46	M	8	B		Resinoid
Wet, 9,000 to 12,000 sfpm		A	60	P	0	R	30	Rubber
HEMMING & KLOTZ CUTLERY								
Cutlery small—Roughing		A	60	L	7	B	4	Resinoid
Finishing		A	100	P	7	E	V	Shellac
SURFACE GRINDING								
	Cupped	32A	24	G	8	V	BE	Vitrified
	Cylindrical	32A	24	G	8	V	BE	Vitrified
	Segmented	32A	301	E	12	V	BEP	Vitrified
	Straight	32A	46	H	8	V	BE	Vitrified
INTERNAL GRINDING								
		A	60	L	5	V	BE	Vitrified

cause of the distortion produced by the harder wheel.

The best results were obtained with the regulating wheel set at an angle of ¾° and running at approximately 32 rpm. Four passes were required, the first two removing 0.006 in. per pass, and the other two removing 0.003 in. per pass. A very good surface resulted, with no distortion of the tube. The grinding wheel had to be dressed quite frequently. Finish grinding consisted of three passes, removing 0.0015 in. on the first pass and 0.001 in. on the remaining two passes. In finishing, an aluminum-bronze-tipped work blade was employed, the regulating wheel was set at 1½°, the work blade set off center approximately ½ in. above the wheel centers, and the regulating wheel run at 30 rpm. Unfortunately, the work blade required redressing every 8 hr, but it was necessary to use this type of material to obtain scratch-free work. Further improvements in regard to scratch-free surfaces were realized by installing a filter in the coolant supply system.

Fortunately, all problems involving centerless grinding of stainless steels are not as complicated as this and, in many instances, experience gained on previous jobs will suffice. However, it is imperative to realize the inherent properties of stainless steels as related to grinding, and to establish practices accordingly. Where difficulty is encountered in precision grinding, the services of wheel manufacturers and lubricant representatives are available. The supplier of the raw material may also be able to aid in solving problems in this field, and many of them have valuable literature available.

Widely varied finishing operations are employed on fabricated parts made from stainless steel, the primary purpose of which is to improve the surface appearance of the item. The operational procedure will vary in accordance with the condition of the part. In many instances, a wheel rough-polishing technique is required to remove such surface defects as die and tool marks. Thus, where drawn parts are submitted to interstage annealing, followed by a suitable descaling process, a grease grinding operation is usually required to prepare the surface for subsequent polishang and buffing to obtain the finish desired.

GLUE AND WATER PROPORTIONS FOR SETUP WHEELS

ALUMINUM OXIDE GRIT NUMBER	% GLUE BY WEIGHT	% WATER BY WEIGHT
24 to 36	50	50
46 to 54	45	55
60 to 70	40	60
80 to 90	35	65
100 to 120	33	67
150 to 180	30	70
220 to 240	25	75

Setup Wheels and Abrasive Belts

In setup wheels, the important elements are the wheel material, the abrasive, and the bonding agent. The following types are recommended by Armco as suitable for grinding and polishing stainless steel:

(1) Canvas wheels. Wheels made of canvas disks cemented or sewed together are excellent for heavy work with coarse abrasive from 24 to 46 grit.

(2) Stitched muslin wheels. Used widely for everything from coarse grinding to fine polishing. Usually bought assembled to size and width desired. However, some shops make their own wheels by gluing or cementing together standard buff sections to give the required width.

(3) Solid felt wheels. These are generally employed with 150 and finer grit for high polishes.

(4) Compress wheels. Used when a formed wheel face is necessary, they are also suited for most of the work done by the stitched muslin wheel. Wheel faces are usually made of rectangular blocks of leather, canvas, felt or walrus hide, radially compressed and assembled into steel side plates. Block construction permits accurate control of hardness and density of the wheel face. Moreover, the face will retain its shape when formed to fit the contour of the work, because of the bias assembly of the segments.

Of interest is the ever expanding use of factory-coated paper and cloth abrasive belts and strip which are being used to an increasing extent for all operations from rough grinding to fine finishing. The advantages of this type of material are: 1) Elimination of setup, which requires considerable equipment and experience 2) uniform quality is inherently good, and the possibility of mixing grits, as may occur in setting up, is eliminated; and 3) usually a larger surface area is available as compared to setup wheels. The belt has also a chance to cool in its travel around the work wheel, this being of some advantage in finishing stainless steel because of the reduction in heat normally realized. When only a small amount of coated abrasive surface is available, as exemplified by a setup wheel, heat generation is considerably greater, so a weakness in glue bond may be experienced, with resultant loss of abrasive.

Cleanliness Is Important

The abrasive ordinarily used in both grinding and polishing of stainless steels is aluminum oxide, the grain size varying from 20 to 240 mesh. The choice of grain size will depend upon the prior condition of the part to be ground and the finish desired at that point. It is of primary importance that various grit sizes used for setup be kept separate. A few coarse grains within a finer grit will ruin the work of the fine grit and will necessitate repolishing through the various stages to remove the scratches.

Besides keeping the various grits separated in the wheel room, it is recommended that all equipment, including the operator's hands, be kept clean and free from abrasive before proceeding to the next operation. The abrasives themselves must be kept clean and free from iron contamination; this and other foreign substances may become embedded in the stainless steel surface and may impair the corrosion resistance of the material. Natural emery is not recommended. The artificial abrasives are more effective and are free from iron. In the finer grits, No. 150 or better, Turkish emery is sometimes preferred as it does not scratch so deeply, and the next finer wheel will do a better job. It should not, however,

be employed for the final operation.

Wheel preparation is of considerable importance, as setup is still widely practiced. Composite cloth wheels give the needed resilient backing to the abrasive grit which has been glued to the wheelface. The stiffer the wheel, the faster the cut and, although softer wheels have a reduced cutting rate, a finer finish is produced with the same grit. Cloth grinding and polishing wheels are made by gluing or cementing sewed muslin buffs together to the thickness required. Each buff section is usually ¼ in. thick and consists of cloth sewed together either by spiral, concentric or radial stitching. The degree of stiffness of the wheel can be regulated; utmost stiffness is obtained by gluing the laminated disks all the way from the hub to near the periphery. The closer the rows of sewing in the buff section, the harder the wheel. Moreover, the finer and tighter the weave of the cloth, the stiffer the buff and the longer its life. For stainless steels, buff sections with cloth thread count of 64/64 or 64/68 are generally recommended.

A good grade of animal hide glue is essential. Bone glue, fish glue and cold glue preparations are relatively inefficient. However, commercial cements and other binders are being utilized successfully without heating. Glue is mixed by weight only, and it is recommended that not more than a 3-hr supply be heated at any time. Mixtures given in the accompanying table are for wheels operating at a speed of approximately 7500 sfpm; if higher speeds are used (9000 sfpm) the glue content in the mix should be increased by about 5% by weight to give a denser head.

Lubricants Are Important

Grease-stick compositions, such as a mixture of mutton tallow and stearic acid which is at least 50% saponifiable, are used to lubricate the face of the wheel, and are ordinarily applied where formed or fabricated articles are to be polished. The advantages are: 1) it prevents glazing and packing of the wheel face; 2) it prevents overheating and consequent deterioration of the wheel; 3) it prevents overheating and discoloration of the metal being polished; 4) it keeps the surface of the work cleaner and brighter, enabling the polisher to inspect his work as he goes along, thereby effecting a saving of time and labor; and, 5) it modifies the cut and greatly improves the color in the final polishing operations.

In finishing flat sheets, a liquid lubricant, such as mixtures of kerosene and machine oil, heavy machine oil, or palm oil can be used.

Polishing techniques will necessarily vary from plant to plant. Variables which must be taken into consideration include, 1) resilience of the wheel; 2) wheel speed; 3) the lubricant, including the nature and quantity applied; 4) the condition of the abrasive; 5) the type of machine used and, 6) the experience of the operator. The sequence of operations given in the accompanying table is included as a guide. Thus, operation No. 1 is

GRINDING, POLISHING AND BUFFING CHART

NO.	OPERATION NAME	GRIT NO.	MFD ABRA	TURKISH EMERY	WHEELS	LUBRICANT	COMPOUND	APPROX SFPM	FINISH
1	**GRINDING**	36 60	x		Rubber or Bakelite bonded	Dry		7000-8000	
2	**ROUGHING**	80	x		Soft cotton fabric, Sewed sections or Quick-As-Wink wheels	Dry		7000-8000	Rough ground
3	**GREASING**	100	x		Same	Grease	Polishing tallow	7000-8000	Grease finish
4	**GREASING**	120 or 150	x		Same	Grease	Polishing tallow	7000-8000	No. 4 finish and base for No. 6
5	**GREASING**	180	x or x		Same	Grease	Polishing tallow	7000-8000	Base for No. 7
6	**GREASING**	220 or 240	x or x		Same	Grease	Polishing tallow	7000-8000	Base for No. 8
7	**CUTTING BUFF**				Bias or pocket		Aluminous oxide buffing compound	10,000 min.	No. 8
8	**COLOR BUFF**				Loose disk or canton flannel buff		Same for coloring only	9,000 max	No. 8
9	**TAMPICO**				Tampico brush		Powdered pumice, kerosene, oil	5,000 max.	No. 6
10	**SPECIAL**				Bias or pocket buff		Lea compound Grade E	5,000 max.	Butler
11	**SPECIAL**				Stainless steel brush		Stainless wire brush	5,000 max.	Wire brush
12	**CLEANING**				Canton flannel cloth, hand operation		Whiting or precipitated chalk		

employed where considerable metal is to be removed, such as grinding a weld area flush, followed by operation No. 2, a rough ground finish, after which the standard polishing operations, using a grease stick, are performed in operations No. 3 to No. 6. Buffing operations follow to give the item a mirror-like finish.

Polishing Precautions

As mentioned above, greater care must be taken in polishing and buffing stainless than is employed in finishing steels or non-ferrous metals. Suggested precautions include:

1. Pressures should be relatively light; the mistaken idea of shortening the finishing time by increasing wheel pressures should be discarded. Increased wheel pressures will lead to overheating, resulting in tinting, buckling, and defective finishes. This is particularly true in polishing light-gage austenitic.

2. Do not use wheel or buffs that have been contaminated with other metals, as these metals may become embedded in the surface and cause electrolytic corrosion.

3. Do not use buffing or greasing compounds containing iron oxide. Specify iron-free or iron-oxide-free compounds.

4. Do no use Turkish emery as the last finishing operation, because of the danger of iron contamination.

5. Do not finish grind with a dry wheel.

6. Break in fresh abrasive wheels on scrap material similar to that on which the wheel will be used. Such broken-in abrasives are essential when making grit comparisons to match a finish.

7. Clean metal surfaces thoroughly when changing grit sizes to prevent expensive reworking by undue scratching by wild grit.

8. Never attempt to remove too much metal with a fine abrasive. Use coarsest grit size possible, consistent with finish.

9. Remember that a fine grit will remove more stock from a surface roughened by coarse grinding than from a smooth surface.

10. Keep abrasive scratches straight and parallel. Herringbone scratches, gouges, and chatter are easily averted by proper technique.

11. Avoid overpolishing of spots, and lift wheel above work before reversing stroke.

12. Protect polished surfaces outside of work area by masking with adhesive paper.

Buffing Operations

Buffing operations are final finishing operations to produce a lustrous and highly reflective finish. Two operations are normally required, the first being termed a "cutting," followed by the second operation termed a "color buff." Although buffing may easily develop into a costly and time consuming operation, especially in the final steps of producing a true, scratch-free, mirror finish, this can be avoided by intelligent and careful planning in the preceding operations of grinding and polishing the work.

Standard buff sections with a standard cloth count of 86/93 are recommended, the width of the wheel being dependent upon the number of sections employed. The resilience of the buff is regulated by separating the sections with cardboard spacers at the hub. Buffing lathes for stainless should not run under 10,000 sfpm and the range of 12,000 to 15,000 is preferred for a cutting buff. For color buffing, speeds in the range of 7,000 to 9,000 sfpm may produce better results. Because of the high speeds employed and the inherent toughness of the stainless steel compositions, a bias, or special ventilated-type, buff is recommended to prevent scorching. Buffing wheels made up of alternate plies of muslin and sisal—a hemp product—resist scorching and have proved satisfactory on stainless steels.

Commercially, the lubricants used in buff work are termed cutting and coloring rouge; however, they are preparations of levigated alumina with different iron-free lubricants. They are supplied in stick or bar form to be applied directly to the rotating buff. For the highest possible finishes, a rouge composed of green chromic oxide (Cr_2O_3) should be used. Buffing should not be attempted on a surface coarser than that resulting from a No. 200 or 220 grit used with lubricants.

Difficulties in buffing stainless steel can be attributed to: 1) too soft a wheel — or one which scratches from the knots in the stitching; 2) too slow a wheel speed; 3) trying to cut and color in one operation; 4) using a cheap buffing compound—one having insufficient body; 5) too much pressure applied during buffing; 6) trying to buff a surface which has not been properly prepared; and, 7) too stiff a buff. Of interest, in regard to polishing with a hard buff, is our experience in buffing hardened knife blades (AISI type 44OC, R$_c$ 60). Apparently, the buff wheel which was 8 in. in dia and approximately 5 ft in length, had a mixture of hard and soft buffs; in buffing, the hard buffs actually polished a slight depression in certain areas within the blade. This was objectionable as the depressions were quite visible under close examination.

Special Finishes

Special finishes, such as satin finish, Butler finish, and wire brush are at times desirable; information on which is given in the table. Satin finish is actually a fine polish, produced in two buffing operations after the normal polishing. Thus, the last polish would use an abrasive of No. 120 aluminum oxide, followed by buffs using a satin finishing compound. This compound is commercially available from 120 to 400 grit, iron free, for working stainless steels. The tampico brush finish is normally known as a No. 6 finish and, in many instances, would follow the normal buffing operations. Finish is best when brush lines are applied in the direction of rolling. It is usually recommended that a long stroke be employed to eliminate lap marks and avoid spots polished to a higher finish than the rest of the work. Both Butler and wire-brush finishes are widely used within the fabricating industries; the latter being quite inexpensively produced. One precaution to follow in wire-brush finishing is that the brush should be made of the same material as the work itself.

Aid or Trade?
A CRISIS AHEAD

A crisis in the foreign trade relations of the United States is in the offing. It is a crisis caused by:

1. Efforts of producers in friendly nations to earn more dollars by increasing exports to the United States, and
2. Efforts of industries in the United States which would be hurt by competition from these imports to keep them out.

This crisis is a threat to the effectiveness of American leadership in the crucial effort to build the nations of the free world into a strong and unified group. It is the purpose of this editorial to advocate a constructive approach to the difficult situation that is developing.

Background of the Crisis

Most countries in the free world—with American aid—have managed to push their outputs well above prewar levels. As they have done so, they have been urged by our highest government officials to increase their exports to us. Sales in our market enable these countries to earn dollars which they use in turn to buy the products of America's farms and factories. Thus, as they become self-supporting, the need of American aid is reduced.

But as these efforts to export more to the United States have promised increasing success, competitive American producers have become increasingly alarmed about what that success might do to them. Consequently, they are seeking more protection—by appeals to the U. S. Tariff Commission to recommend higher import duties and by appeals to Congress for new laws to discourage imports.

Our Friends Protest

A year ago Congress answered one of these appeals by imposing a quota on imports of dairy products. Now, among many other legislative proposals being strenuously pressed is a move to extend the scope of "Buy American" legislation. A year ago the U. S. Tariff Commission had only four petitions for increased import duties on its docket. Since then fourteen more petitions have been filed and others are definitely on the way.

Faced by these mounting efforts to block the sale of their products in the American market, no less than eleven friendly nations, including Great Britain, France, Italy, Canada, the Netherlands, Switzerland and Denmark, have filed protests with our State Department. Through many of the protests runs one refrain. Although stated in diplomatic language, it might be correctly paraphrased to say: *"In*

sending us aid you have made it very clear that you want us to get on a self-supporting basis at the earliest possible moment. But, when we begin to make headway in that direction by trying to sell you more of the things we are equipped to produce, you start closing your market to us." The threat of European resentment against the United States being stirred up by this argument is obviously great.

At the same time there exist grounds for special resentment in the United States against certain prospective imports of European manufactured goods – those of machine tools, for example. In part these will be produced with machinery that has been sent to Europe as part of our economic aid program. With absolutely no diplomatic language involved, the argument, which will be extended much farther than the facts would justify, will run: *"We gave those people the equipment that they now use to cut our throats!"* This line of argument will find response among workers as well as employers in industries faced by more competition from imports. Labor, too, is keen for protection against more foreign competition.

Aid or Trade?

As between continuing direct economic aid to Europe or accepting the imports that would make those countries self-supporting, some would prefer to continue the aid program. They argue that the tax machinery of the federal government can spread the burden of aid broadly, while we have no comparable machinery that can cushion the shock to individual industries, firms and communities that may result from stepped-up imports of competitive products.

As we see it, this position is untenable. It would make rubbish of our Atlantic Charter promise ". . . to further the enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity." It would be an admission that, for all our profession of faith in competition and our opposition to European cartels, we really don't believe in competition.

U. S. Self-Interest

The people of this country have invested billions of dollars and seven years of hard work in the attempt to put our allies on a self-supporting basis. If we keep their goods out by raising trade barriers, we are directly defeating our own purposes.

Also, in moving to protect some groups of American producers we should be hurting others. For many American producers the export market, which this year will take about $14 billion of civilian goods, spells the difference between operating at capacity and closing down 25% of their facilities. When we discourage imports we cut off dollar earnings by other nations which are spent here to keep some of our factories and farms going.

At the same time, it must be recognized that certain American industries and their capacity to maintain employment will be hurt by increased imports. Hence it becomes critically important for the United States to formulate a national program designed to help these industries and communities take up the shock.

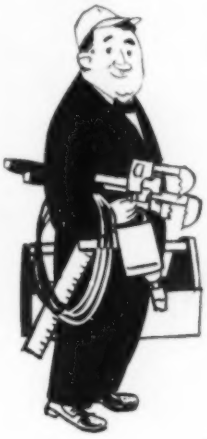
There is no neat and simple prescription by which this can be done, but several possibilities have been suggested. One on which there is general agreement is that tariff reductions should be gradual. To cushion their impact, the government might well give preference on defense orders to industries and areas adversely affected by an increased volume of imports. Direct assistance to workers and companies in shifting to different lines of business may be worth consideration.

These are by no means all the possibilities. They may not even be the best. But they do serve to suggest the necessity for flexibility and imagination in dealing with the growing crisis in trade relations. *Our ingenuity in developing new ideas to meet this crisis may well be a decisive factor in our effort to weld the free nations into a strong and durable alliance.*

McGraw-Hill Publishing Company, Inc.

ROUND TABLE

Borrow—or Steal?



"Ed, I've got a problem on my hands this time. Rogers, the man who's building his own place out in Glenridge, is sore as a boil at me because I put a damper on letting him borrow a pair of pipe wrenches over the weekend."

"What's wrong with letting him have them, Al? He'll bring 'em back. And if he doesn't, he'll pay for 'em."

"It isn't that, Ed; it's the idea of letting company tools go out. This isn't the first time a request has been made. I don't want to stick my neck out by letting a man have the use of something, then having to stand responsible for it. He'd pay if he lost or broke 'em, but that possibility sets up more trouble—unless I bought second-hand wrenches and snuck 'em through the gate."

"I think you're being too fussy and are making a mountain out of a mole hill; I can't see what harm can come by letting a man have the use of something now and then to help him out—he can't do the tools much damage."

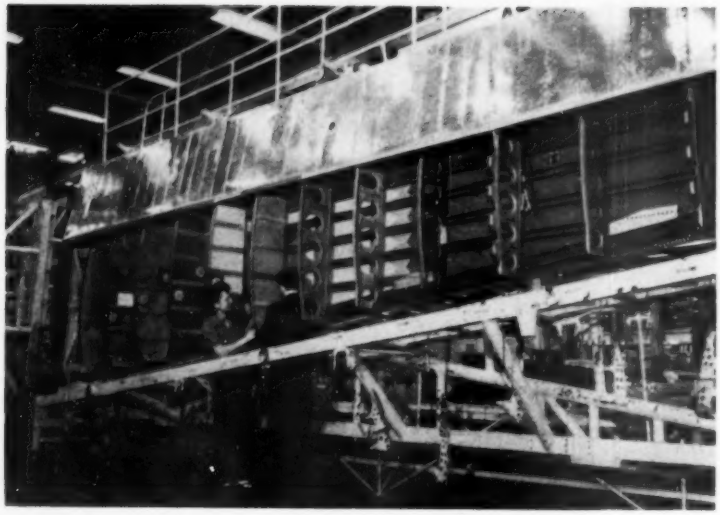
"If I let Rogers have the wrenches, I've got to let anybody else have anything he needs. The first thing you know they'll be asking to take an electric drill home."

"It'll show the fellows that you are cooperating with them if you're willing to loosen up a bit. Besides, what if a tool is lost, Al? It can always be fixed up—honestly, I mean. I'd much rather take the chance and let the men borrow something now and then, than to have them slip something under their coats and take it home to use anyhow." "No, Ed, the only right way is a ruling that company tools are not to be taken from the plant for use on employee projects. If the company establishes such a policy and let's them know about it, I don't see where they have any kick."

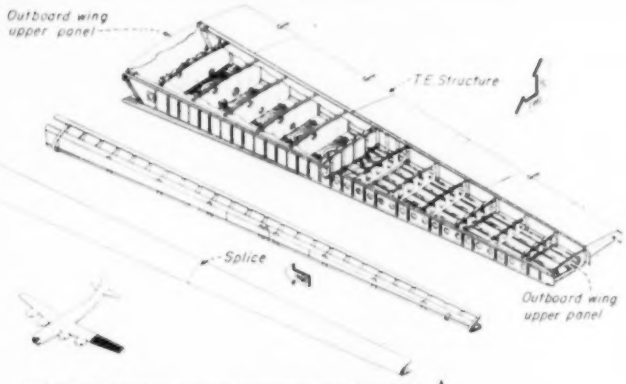
"It's the smallness of the idea that I don't like, Al; we've never lost anything yet nor has the privilege been abused by the men. I'd rather be a little loose than to do anything that will encourage dishonesty or sound stuffy."

***WHAT** about lending company tools for a "little" private use? Does it lead to excess? Is such lending better than an arbitrary denial? Your ideas and opinions on this subject will interest others. Discussions of earlier topics appear on later pages.*

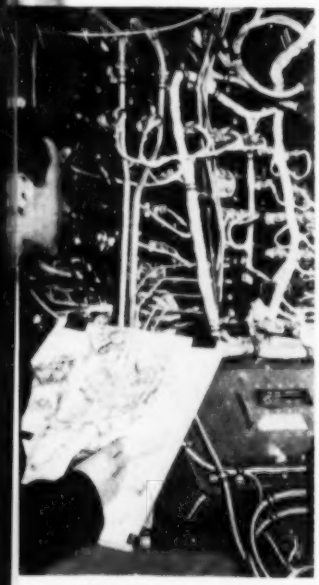
Picture Prints Speed Assembly



Wing Section of C-97 freight plane actually looks like this ↑



Production illustration is a good approximation of the photo ↑



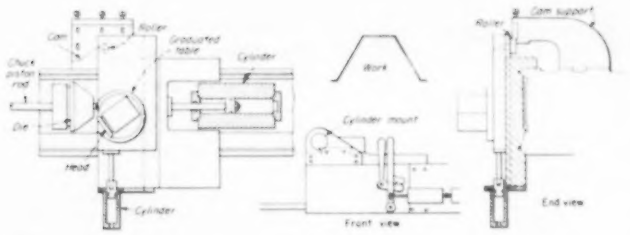
Illustrator picks up details, including order of assembly, from actual plane to make sketch of fuselage assembly. Heavy lines indicate parts for whose assembly this sketch will be used

Production illustrations that show workers exactly how assemblies really look are being utilized more and more, and may indicate a trend away from conventional blueprints. Boeing Airplane Co uses 30° isometric drawings, made by professional illustrators, at a scale of one to ten.

The drawings are made from the first production model of the plane, then converted into black-and-white prints for assembly workers. There are few, if any, dimensions, and most instructions are given in keyed notes right on the drawings.

Boeing finds the drawings excellent replacements for regular prints, and also notes that drafting errors are seen and corrected easier. Most effective subjects for the illustrations are the wiring and tubing lines in a fuselage or wing. Drawings are constructed partly from regular blueprints, partly from the plane itself, with wiring and tubing drawn in heavily, background parts lightly.

Practical Ideas



Strengthened Engine Lathe Does Tough Spinning Jobs

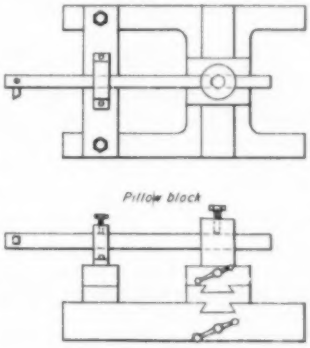
A NUMBER OF SHOPS are more interested in spinning for job-lot sheet-metal work than ever before. Here is a lathe equipped for spinning skimming-machine disks that can also be adapted for taper turning and contouring.

The machine is a rigidly built lathe with a beefed-up spindle that will take considerable side pressure. A free-rotating spinning head is mounted on a graduated circular table on top of the slide. The head has radial and thrust bearings, and supports a rounded wheel that will form the work.

Normal gear power is not enough to form heavy stock, so two additional power sources are used. A hydraulic cylinder is fitted to a base on the ways in place of the tailstock. This powers the carriage in addition to regular gearing. A second cylinder mounted in the front of the lathe on the carriage powers the slide, particularly for the purpose of forcing the roller at the rear of the slide back against the cam track mounted on an auxiliary frame attached to the machine bed.

Chucking is done with an air cylinder whose piston rod goes through the lathe spindle and projects in front of the work because of a square hole punched in the part. A slotted washer slips over grooves in the end of the rod, and the cylinder is operated to pull back firmly on the work.

Actually, spinning can be done without use of the cam and roller, but this equipment controls the thickness of stock. *Contributed anonymously.*



Boring-Bar Brace Allows Quick Adjustment

A BORING-BAR BRACE recently described by Alden W Buckles (*AM* June 9 '52, p 164) struck me as not too adaptable, particularly if you wanted to shift the boring bar for a second cut, for taper work, or for facing the bottom of a blind hole. I also question the ability of the brace to hold the bar rigid in a horizontal direction.

I would suggest that you bolt a heavy bar across the front (headstock end) of the lathe-carriage extensions, then clamp a pillow block to take the boring bar on this brace. Strong but removable clamps would allow adjusting the boring bar easily, because you could shift the pillow block, then reclamp it. *Louis Meyer, St. Louis, Mo.*

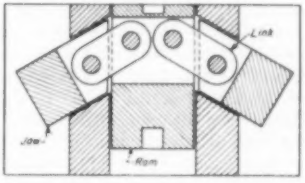
Centering Drill Jig Grips Parts Securely

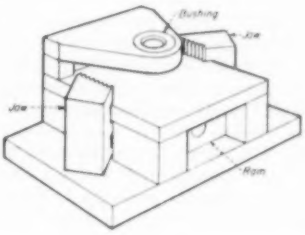
ONE PART we produce has a 1-in. hole at a required distance from one edge, located centrally between the two adjacent sides. This drill jig was developed to incorporate simplicity and ruggedness, and has worked well for some time.

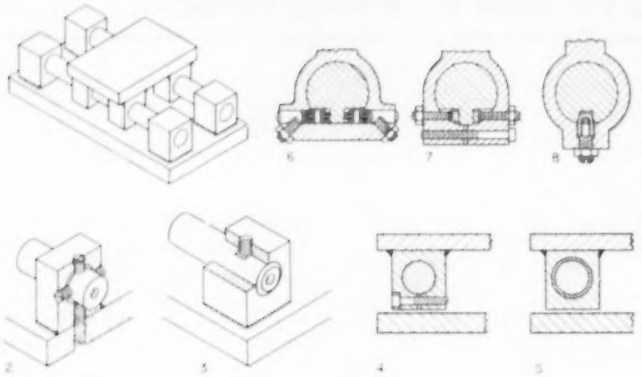
A central ram is guided in ways and operated by a double-acting air cylinder. Linked to this ram are two side jaws with serrated clamping fames. The jaws are at an angle of about 60° to the centerline of the ram and are also guided in ways.

The rectangular workpiece is loaded against a stop at the back edge of the jig, and is held there by finger pressure while the air cylinder is tripped and the side jaws close on the work. The jaws center the work exactly, and grip the work against the rear stop, thus locating the work as required.

The jig is just about foolproof. *James G. Decker, Marshall, Mich.*







Round Bar Stock Makes Inexpensive Machine Slides

WHERE SPECIAL MACHINES must be made, or where old slides must be replaced; and if the table motion required is slow, round stock can be fabricated into slides at low cost.

The simplest model for table slides is shown at 1. Here a heavy plate forms the base of the mechanism, four heavy posts support the round slides, and four supports move on the slides to carry a table. Construction is by welding.

The contradictory principle of making machine slides in your own shop is that precision equipment, particularly a jig borer, is necessary to produce a machine of rough accuracy. The holes through the supports and posts must be bored accurately parallel with the length of the base and table to allow unhampered motion. If accuracy is quite high, manufacturing costs of such a machine table are low because gibs, adjustments, and other usually necessary equipment can be eliminated.

Several little points make this construction practical. As shown at 2, setscrew can be located all around the slide at the anchoring post, but tightening pressure should be vertical. This is necessary because a horizontal tightening will change the distance between the slides, making the table bind. In addition, any vertical adjustment is easier to make, because corrections can be made vertically, and checking can be done with a level.

As long as the holes through the posts on the base are aligned correctly, their diameter may vary on the large side. As at 3, a setscrew can be placed against a flat notch in the end of the slide to anchor the slide.

For the support blocks attached to the table, good sliding action is necessary. A split block (4) can be used, or a hardened liner (5) can be inserted to take wear. Precision is required here to get the liner forced into the block and to make sure the liner ID works easily on the slide, but the extra work may be worth it.

More elaborate slides can be made with the construction shown at 6 and 7, where a key that keeps the slide aligned is cut into the round stock itself, and keyway bearings are made by adding ball bearings on inserted pins (adjusted by angled setscrews working against notches in the pins) or simply with bearing blocks controlled by screws. The simpler method works best with a split housing for the slide.

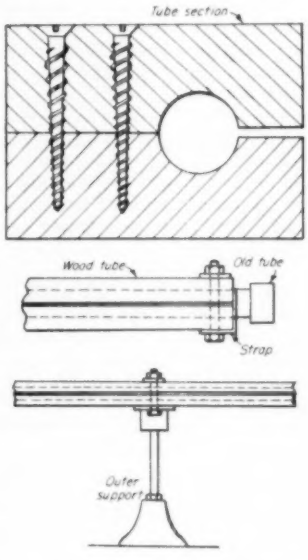
A wedge key (8) can be inserted in a tapered keyway cut in the slide, but this must work vertically for the same reason that the setscrew in the base post must be vertical. *Clifford T. Bower, London, England.*

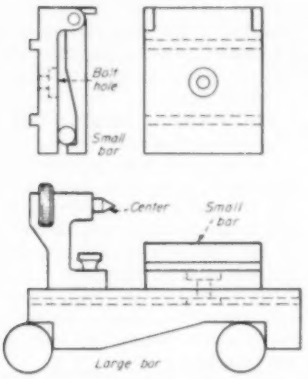
Wood Stock Tubes Cut Shop Noise

WOOD LINERS for lathe stock-feed tubes are a fair answer to the problem of shop noise, but they are difficult to fit to the lathe, and are not, to my way of thinking, very satisfactory. When we were delivered two new small lathes without any liners at all, I decided to try solid wood for the tubes.

Our patternmaker routed long planks of soft, straight-grained wood to the cross-section illustrated. The stub of the old metal feed tube was left on the lathe, and was attached to the new wood tube by a bracket. The old floor stand that supported the metal tube was replaced.

The wood tubes are joined by a few woodscrews. Action is most quiet—about 80% better than before, and we expect to cut even more noise by using a pusher made of plastic material. Wear does not seem to be a problem, but even if it were, the wood is cheaper than steel. *N. Palmer, Paddington, Australia.*





Super Sine Bar Does Multiple Work

WE MADE TWO SINE BARS, each of them capable of being operated separately, to allow setting up any angle or combination of angles for shop inspection work. In addition, the larger bar is fitted with centers, which hold reamers and similar tools when angles must be produced on them.

The large bar is conventional except that it has a T-slotted table. This takes the centers (only one of which is illustrated) or the smaller bar, depending on what kind of work is to be done. The centers are fitted with T-blocks that fit in the slots, and which are tightened by screws in the bases of the centers.

The small sine bar is made with tenons on its under side. These fit the T-slots, and are machined carefully to provide a snug fit when the two bars are assembled together. A countersunk hole in the base of the small bar admits a bolt that assembles into a tapped hole in the middle of the plate of the larger bar. This locks the two bars firmly together.

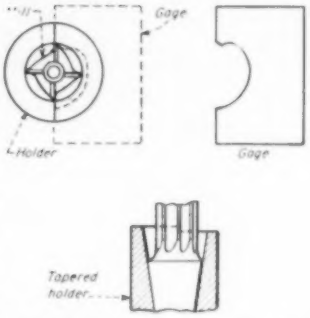
The large bar was built on 5-in. centers, while the smaller one was on 2½-in. centers. Aside from the special features mentioned, both bars are otherwise conventional. Two independent bars, we find, are easier to set up for compound angles than a single, complicated bar. Construction, too, is easier. *R. G. Vare, Christchurch, England.*

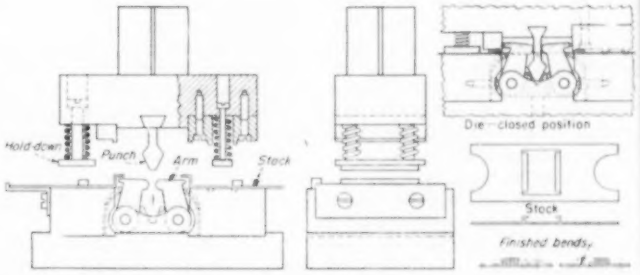
End-Mill Gage Checks Clearance Angles

WHEN REGRINDING end mills, a quick check on the clearance angle is provided by a little gage made partly from sheet metal. The gage itself is cut out to produce a hole that will clear the flutes of the mill. One edge of the hole is ground back at the required angle.

A holder for the mill can be made many ways, but a simple one is formed by drilling a piece of stock, then milling through it with the end mill being checked. A step is cut up to the center of the holder with the same end mill, and the mill is then loaded into the holder and the gage placed against the edge of the step.

A tapered-shank mill can be checked the same way, though the holder must be drilled, then mill-cut to fit the shank of the mill. The top edge of the holder must extend beyond the shank up to the level of the mill flutes. *N. Schwartz, Jackson Heights, N. Y.*



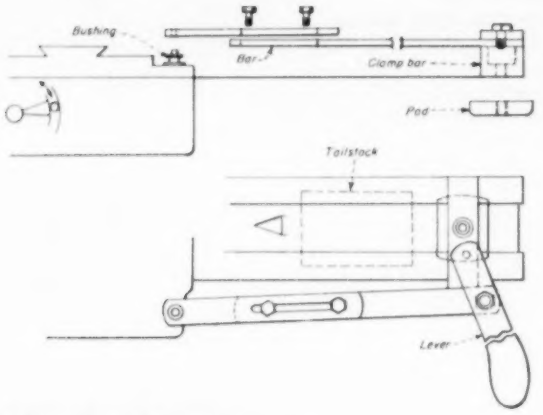


Double-Bending Die Set Forms Small Channels

THE WORK WE RAN through this die was a flat sheet-metal part with a central rectangular hole, the two edges of which were step-formed in the blanking die. These steps had to be flattened back on their folds to form thickened seams at the edge of the hole. Our special press tool worked like this:

Two pinned arms operated in the lower die. These were formed to lip shape on the outside so they would bend and push the ears on the stock, and were rounded on the inside so the punch would move them in and out. The arms were just as wide as the blanked hole in the stock, so the punch, moving down with the ram, forced them outward to make them fold down the first flap of the step on each side. The wiping action of the punch forced the flap down flat, then a formed punch block on each side of the main punch flattened the flap permanently.

The punch is cut back above the wiping section to allow the spring-loaded arms to retract to clear the flattening punches. Stops are provided in the lower die to prevent the arms from closing too much, and the nose end of the punch is rounded so it will move in smoothly to separate the arms. Spring-loaded holddowns are provided instead of a stripper. *H. Hahl, Uplands Vasby, Sweden*



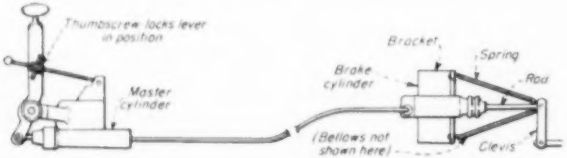
Saddle-Feeding Lever Speeds Bench Lathe

FOR FASTER MOTION of the saddle, either for advancing or retracting, this lever can be added to most bench lathes without altering the basic operation of the machine. Adjustments are provided by this design to allow almost any kind of operating action.

A clamp bar and pad are attached to the lathe bed behind the tailstock. The hand lever is pivoted on this bar, and the adjustable arm is pivoted on the hand lever. The arm is at the same height as the clamp bar; therefore, the length of the bar can be trimmed to control the amount of backward throw of the mechanism.

Forward throw is controlled by the distance between the two fulcrum pins in the hand lever. Saddle position is adjusted by lengthening or shortening the arm. A spacer bushing, which pivots the end of the arm at the saddle, is made up of plain bushings and collars.

The saddle can be operated with either the usual handwheel or with the lever; or may be operated by both. *Ian J. Peacock, Cumberland, England.*



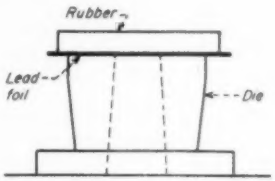
Remote Throttle Control Built Cheaply, Installed Quickly

IN OUR SHOP we rebuild locomotive cranes and other big steel-yard equipment, and one of our problems is in making up new throttle-control mechanisms. Mechanical linkages take a long time to install, and wear out rapidly. Linkage wear causes throttle creep, which results in dangerous faltering or racing of the engine.

The answer to the problem is a hydraulic throttle made up from reconditioned junk parts or new parts bought from an auto-supply store. The master unit is made from a Chevrolet master brake cylinder, a gearshift handle, and a thumbscrew collar and clamping rod that permit locking the handle in any position.

The slave unit is a brake cylinder from an International truck. This is bolted to a bracket that also supports a ½-in. rod. One end of the rod is fitted with a brake clevis, which attaches to the engine throttle bar. The other end is rounded, and fits against the piston of the brake cylinder. Two long springs keep the rod against the brake piston. A rubber bellows fits over the rod to keep out dust.

Assembly must be done carefully to keep air and dirt out of the units and out of the copper line that connects them. Results are top-notch; the action is smooth and positive, and costs are low. *Irving Epstein, Seattle, Wash.*

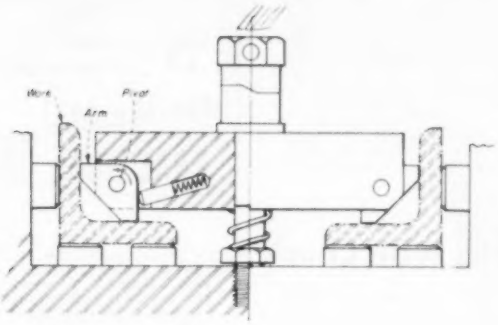


Rubber Punch Cuts Lead Foil

LEAD STOCK 0.005 in. thick is punched to washer shape with a hardened steel die and a rubber punch mounted on the end of a press ram. The same tooling will also cut aluminum and zinc stock of the same thickness.

The thickness of the rubber is important. For an OD of 3 in. and an ID of 1 in., the rubber disk was 4 in. in dia and ½ in. thick. The rubber not only pinches the stock over the edge of the die, but holds it flat against the face of the die to prevent distortion. Thickness of the rubber should not exceed ½ in. for this job because cutting properties would be lost.

Worn rubber may be replaced when the stock shows signs of wrinkling under it, although a new piece lasts us for many thousands of operations. *T. H. Hsu, Taiwan, Formosa.*

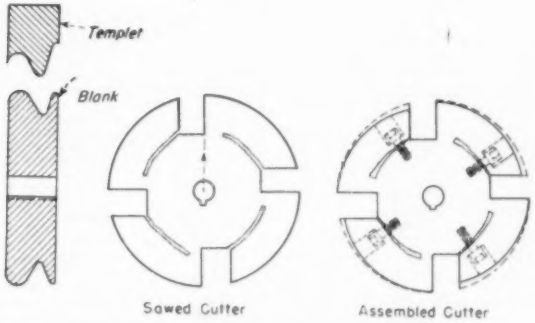


Double Equalizing Clamp Grips Twin Parts

A SINGLE CLAMPING LEVER or cam operates this fixture to grip two angle plates for drilling.

Pivoted arms with two feet are set into the main horizontal member of the fixture to press the parts against three buttons each. Spring-loaded pins behind the arms make them touch the horizontal part of the work first, then equalize pressure against the sides of the parts.

To overcome slight differences in thicknesses of the parts or slight misalignment of the main spindle, the hole through the main horizontal member is a sloppy fit around the main bolt. Rounded feet instead of squared ones might be more practical. *Edward Walker, Waukesha, Wis.*



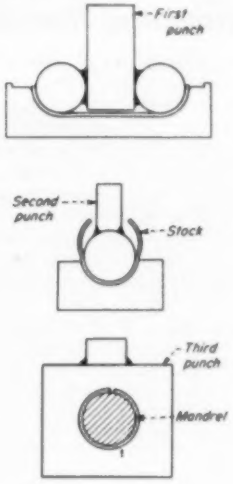
Making Special Cutters For Odd Milling Jobs

FORM-MILLING CUTTERS for short jobs can be made without the usual extensive operations if you can do your milling slowly and take small cuts. If this is possible, a milling cutter can be made in the following way:

Turn a blank to the profile desired, then gash the edge in four places equidistant around the OD. One edge of each gash should be on a radial line, which will produce the cutting faces.

Next, saw a roughly circular arc from the rear of each segment toward the cutting face, going about two-thirds or three-quarters of the way to the cutting face. Now drill and tap a hole through each segment and into the cutter body, and assemble capscrews to tighten down the segments against the body. This provides clearance. The last operation is hardening.

Regrinding can be done a number of times until the remaining solid metal holding the segments to the body is too weak to hold up under the cutting action. *L. B. Williams, New Orleans, La.*



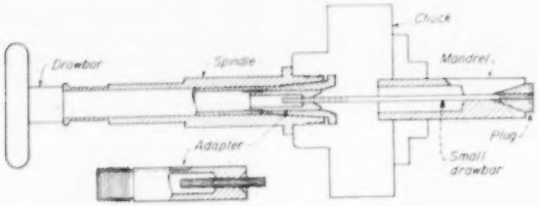
Three Dies Form 1-in. Rings

WE MAKE RINGS from 0.05-in. steel stock in a three-die lineup that is handy in a job-lot shop. Stock is first cut to exact length, then moved to the first forming die.

Here, the punch is a rectangular piece with a cylindrical section welded to each side. The die is an open one with the same radius as on the cylinders formed at each end. This set starts the curve.

The second die continues the curve. A single cylinder is attached to the punch, and the die is half a cylindrical section. Although this operation does not produce a smooth curve, the bend where the two curves join is not severe.

The third die completes the ring around a mandrel inserted in the die by hand. This same process forms aluminum rings of a smaller diameter. *T. H. Hsu, Taiwan, Formosa.*



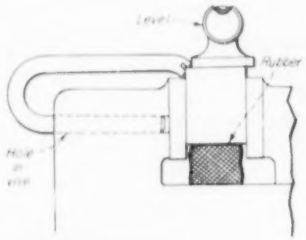
Expanding Mandrel Works With Chuck

MADE MAINLY FROM MANUFACTURED PARTS, this mandrel chucks parts on an ID to allow turning the complete OD and facing one end. The only point of possible trouble is in loading the chuck over the collet adapter. In some cases it might be necessary to make a different collet adapter or grind down an existing one to permit loading the chuck into position.

The assembly is built up by starting with a drawbar, which is located inside the lathe spindle. To this is attached a drawbar adapter that works inside the main drawbar. A small tapered drawbar is held by the drawbar adapter, and on its end is mounted a tapered plug. This is slotted and provided with a screw to allow slight adjustment to control expansion of the mandrel.

A split mandrel is held by the chuck to take the work. This is a conventional type with a tapered hole in its end, in which the tapered plug works to expand and release the mandrel.

The whole assembly is readily made, and allows locating parts on an ID without extensive toolroom work. M Sgt *James K. Wood, Hempstead, Mitchel AFB, N. Y.*



Vise Gage Locates Part for Clean-Up

TRIMMING AND FINISHING CUTS on a shaper or milling machine can be taken quickly after the work is set up this way. The work is a rectangular piece of small size.

Clamping is done in a vise. A piece of rubber is dropped in under the part to hold it up, even under weight of the level. The gage is slipped into a longitudinal hole in the vise until the notched end contacts the work. The work is pushed down to nest under the notch in the gage, the level is placed on the work to allow adjustment, and the vise is locked. After the gage and level have been removed, the final cut can be taken.

This idea is useful where a number of parts must receive a small, clean-up cut. The distance between the hole in the vise jaw and the top edge of the notch is worked out to leave top of the part just a few thousandths above the bottom of the cutter, which results in a cut of a few-thousandth thickness. *N. Palmer, Paddington, Australia.*

EXTRACTING A BROKEN TAP or bit from a relatively small piece of steel isn't as difficult as getting one out of a large piece. You heat the part red hot, then cool the outside with wet rags. This exerts tremendous pressure on the jammed bit. After the work is cold, you reheat the part, whereupon the broken bit should come out easily. *C. R. Gladding, Brampton, Ont.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT – $25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS — Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worrry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product — in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER – Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

154th Winner:

(For May 26, '52 Issue)

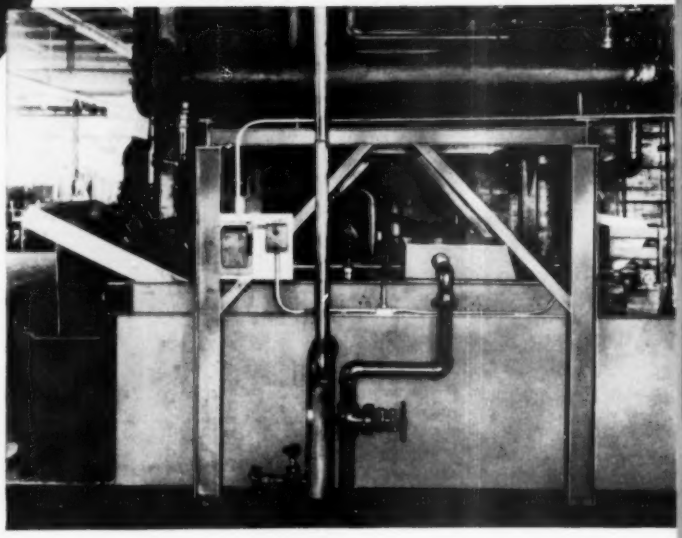
Frank M Butrick

Tool Backup
Braces Bit

Average diameter of a hole
Bearing race matching
Angle between bore and face
Diameter
Thickness
Bore center distance
Crank throw, eliminating all error due to diametral tolerance
Twist
Bend
Typical Dimensions and Relationships measured with
Sheffield
PRECISIONAIRE GAGES
Lobing or cloverleaf of a centerless ground shaft
Internal radial clearance
Flatness
Distance between hole centers eliminating all error caused by diametral tolerance
Center distance of incomplete holes eliminating all error caused by diametral tolerance
Sheffield corporation
SHEFFIELD

Delpark FILTERS Quenching Oil

...AT Chain Belt OF MILWAUKEE



★ In the plant at Chain Belt Company, in order to obtain better control of the quench oil properties, a Delpark Filter has been installed to eliminate the breakdown products of the quench oil in addition to the scale and carbon soot carried in the oil by their heat treating operations. It has been found that this filtering unit is definitely removing these foreign matters, thus enabling them to maintain more uniform viscosity and lowering their maintenance costs. This lower cost is brought about by the fact that there is less accumulation of foreign matters in their heat exchangers and settling tanks.

With approximately 12,000 gallons of oil in the entire system, the Delpark Industrial Filter, by pumping 50 gallons per minute, assures a complete change of oil once every four hours. In the span of an 8-hour day, 24,000 gallons of oil are filtered at an approximate cost of $1.20 per day for filter media.

There's a Delpark Industrial Filter to fit your requirements. Let a Delpark Industrial Filtering Specialist show you the facts on the finest in Industrial filtration. Write for more complete information.

PATENTS PENDING

Delpark

INDUSTRIAL FILTRATION

Backed by 30 Years Experience in Industrial Filtration

INDUSTRIAL FILTRATION CO. LEBANON, INDIANA

Pin Measurement Tables for Involute Gears...IX

DIMENSION OVER PINS

20° PA tables are used for stub teeth as well as full-depth 20° teeth. Also, calculations may not be exact in the fourth decimal place, because readings were taken from the calculating machine at that point without interpolation.

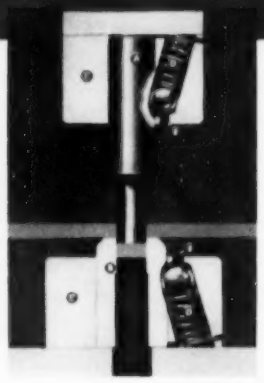
ACTUAL PIN DIAMETER — 0.1375 ¼ CP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	0.9820	0.9823	47	3.9349	3.9312	84	6.8838	6.8788
11	1.0529	1.0531	48	4.0167	4.0129	85	6.9623	6.9573
12	1.1427	1.1426	49	4.0944	4.0905	86	7.0430	7.0380
13	1.2150	1.2147	50	4.1761	4.1722	87	7.1215	7.1165
14	1.3030	1.3025	51	4.2538	4.2498	88	7.2023	7.1972
15	1.3763	1.3757	52	4.3354	4.3314	89	7.2808	7.2757
16	1.4632	1.4624	53	4.4132	4.4092	90	7.3615	7.3564
17	1.5373	1.5363	54	4.4947	4.4907	91	7.4400	7.4349
18	1.6233	1.6221	55	4.5726	4.5685	92	7.5207	7.5156
19	1.6979	1.6966	56	4.6541	4.6499	93	7.5993	7.5941
20	1.7832	1.7817	57	4.7320	4.7278	94	7.6800	7.6748
21	1.8583	1.8567	58	4.8134	4.8091	95	7.7585	7.7533
22	1.9431	1.9413	59	4.8913	4.8871	96	7.8392	7.8340
23	2.0185	2.0167	60	4.9727	4.9684	97	7.9178	7.9126
24	2.1028	2.1008	61	5.0507	5.0463	98	7.9984	7.9932
25	2.1786	2.1765	62	5.1320	5.1276	99	8.0770	8.0718
26	2.2625	2.2603	63	5.2100	5.2056	100	8.1576	8.1523
27	2.3386	2.3363	64	5.2912	5.2868	101	8.2362	8.2310
28	2.4221	2.4197	65	5.3693	5.3649	102	8.3168	8.3115
29	2.4985	2.4960	66	5.4505	5.4460	103	8.3955	8.3902
30	2.5817	2.5791	67	5.5287	5.5241	104	8.4760	8.4707
31	2.6583	2.6556	68	5.6098	5.6052	105	8.5547	8.5494
32	2.7413	2.7385	69	5.6880	5.6834	106	8.6352	8.6299
33	2.8180	2.8151	70	5.7691	5.7644	107	8.7139	8.7086
34	2.9008	2.8978	71	5.8473	5.8426	108	8.7945	8.7890
35	2.9777	2.9747	72	5.9283	5.9237	109	8.8731	8.8677
36	3.0601	3.0571	73	6.0065	6.0019	110	8.9537	8.9482
37	3.1373	3.1341	74	6.0876	6.0829	111	9.0324	9.0269
38	3.2194	3.2165	75	6.1659	6.1611	112	9.1129	9.1074
39	3.2969	3.2936	76	6.2468	6.2421	113	9.1916	9.1861
40	3.3787	3.3758	77	6.3252	6.3204	114	9.2721	9.2666
41	3.4564	3.4530	78	6.4061	6.4013	115	9.3508	9.3453
42	3.5380	3.5351	79	6.4845	6.4796	116	9.4313	9.4258
43	3.6159	3.6124	80	6.5653	6.5605	117	9.5100	9.5045
44	3.6973	3.6944	81	6.6437	6.6388	118	9.5905	9.5850
45	3.7754	3.7718	82	6.7246	6.7196	119	9.6692	9.6637
46	3.8565	3.8536	83	6.8030	6.7981	120	9.7497	9.7441

ACTUAL PIN DIAMETER — 0.275 ½ CP 14½° and 20° PA

TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	1.9640	1.9647	47	7.8698	7.8623	84	13.7676	13.7577
11	2.1059	2.1061	48	8.0334	8.0258	85	13.9245	13.9145
12	2.2853	2.2851	49	8.1887	8.1810	86	14.0861	14.0761
13	2.4299	2.4293	50	8.3521	8.3443	87	14.2430	14.2330
14	2.6061	2.6051	51	8.5076	8.4997	88	14.4045	14.3945
15	2.7527	2.7513	52	8.6708	8.6628	89	14.5616	14.5514
16	2.9265	2.9248	53	8.8264	8.8183	90	14.7230	14.7128
17	3.0746	3.0725	54	8.9895	8.9813	91	14.8801	14.8699
18	3.2466	3.2442	55	9.1452	9.1369	92	15.0415	15.0312
19	3.3958	3.3932	56	9.3081	9.2998	93	15.1986	15.1883
20	3.5664	3.5635	57	9.4639	9.4555	94	15.3599	15.3496
21	3.7166	3.7134	58	9.6267	9.6183	95	15.5170	15.5067
22	3.8861	3.8826	59	9.7827	9.7741	96	15.6783	15.6679
23	4.0371	4.0333	60	9.9453	9.9367	97	15.8355	15.8251
24	4.2056	4.2016	61	10.1014	10.0927	98	15.9968	15.9863
25	4.3572	4.3531	62	10.2639	10.2552	99	16.1540	16.1435
26	4.5250	4.5206	63	10.4200	10.4112	100	16.3152	16.3047
27	4.6772	4.6726	64	10.5825	10.5736	101	16.4725	16.4619
28	4.8442	4.8394	65	10.7387	10.7298	102	16.6336	16.6231
29	4.9969	4.9919	66	10.9010	10.8920	103	16.7909	16.7803
30	5.1634	5.1582	67	11.0573	11.0483	104	16.9521	16.9414
31	5.3165	5.3111	68	11.2196	11.2105	105	17.1094	17.0987
32	5.4825	5.4770	69	11.3760	11.3668	106	17.2705	17.2598
33	5.6360	5.6303	70	11.5381	11.5289	107	17.4278	17.4171
34	5.8015	5.7957	71	11.6946	11.6853	108	17.5889	17.5781
35	5.9553	5.9493	72	11.8566	11.8473	109	17.7463	17.7355
36	6.1205	6.1144	73	12.0132	12.0038	110	17.9073	17.8965
37	6.2746	6.2683	74	12.1752	12.1657	111	18.0647	18.0539
38	6.4394	6.4330	75	12.3318	12.3223	112	18.2257	18.2148
39	6.5938	6.5872	76	12.4937	12.4841	113	18.3832	18.3723
40	6.7583	6.7516	77	12.6503	12.6407	114	18.5441	19.5332
41	6.9128	6.9060	78	12.8122	12.8025	115	18.7016	18.6907
42	7.0771	7.0702	79	12.9689	12.9592	116	18.8625	18.8515
43	7.2315	7.2248	80	13.1307	13.1209	117	19.0200	19.0090
44	7.3959	7.3887	81	13.2874	13.2777	118	19.1809	19.1699
45	7.5509	7.5436	82	13.4491	13.4393	119	19.3385	19.3274
46	7.7147	7.7073	83	13.6060	13.5961	120	19.4993	19.4882

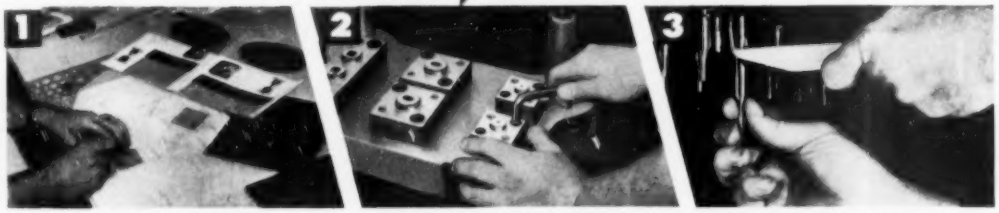
You Save Time with R-B PUNCHES and DIES



How They Work . . .

R-B punches (A) and die buttons (B) are locked in standard or special retainers (C) which are mounted on the die shoes. A spring-loaded ball lock (D) produces positive radial alignment and vertical locking; *no additional keying is necessary regardless of the size or shape of the punch.* Up to ¾" stock can be pierced. R-B punches and dies are easy to insert; push and twist and they're locked. They're easily removed, too. Retainer holes (E) provide for insertion of tanged tool which releases ball and allows instant removal.

How They Save Time



IN DIE DESIGNING

R-B standardized retainers are available in three shapes and many sizes, and where necessary, R-B special retainers can be supplied. You save "time on the board" because you are working with *standardized* equipment.

IN DIE CONSTRUCTION

R-B punch and die retainers and special retainers are quickly, easily and accurately mounted without special machining. With them, you can save much of your skilled die-makers' time.

IN DIE OPERATION

HERE'S WHERE YOU *REALLY* SAVE. R-B punches and dies cut press down time for replacement to a minimum. They're instantly removed—quickly changed—yet accurately aligned when locked.

TOOL STANDARDIZATION IS THE BASIS FOR EFFICIENT AND ECONOMICAL PRODUCTION. WITH R-B YOU GET THE ACCEPTED STANDARD OF THE SHEET METAL INDUSTRY—IN STANDARD DESIGN FEATURES THAT SAVE IN ENGINEERING, DIE CONSTRUCTION AND OPERATION.

ALLIED PRODUCTS CORPORATION
RICHARD BROTHERS DIVISION
DEPT. 63 • 12605 BURT ROAD • DETROIT 23, MICH.

Please send me your 52-page free catalog.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Also Produced in
ALLIED'S FOUR PLANTS
HARDENED AND PRECISION GROUND PARTS • STANDARD CAP SCREWS • SPECIAL COLD FORGED PARTS • SHEET METAL DIES • ALLITE DIES CAST OF ZINC ALLOY • JIGS • FIXTURES

Pin Measurement Tables for Involute Gears...X

(BASED ON 1.728 SERIES OF PINS)

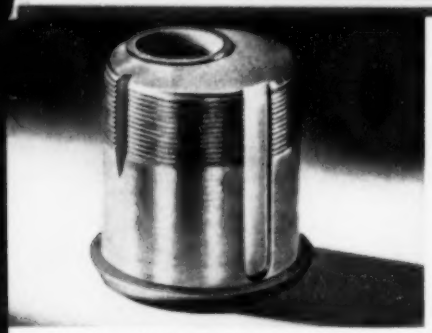
BY RALPH E RAWLING, President, RAWLING GEAR WORKS, INC, WORCESTER, MASS.

ACTUAL PIN DIAMETER — 0.4125 ¾ CP 14½° and 20° PA

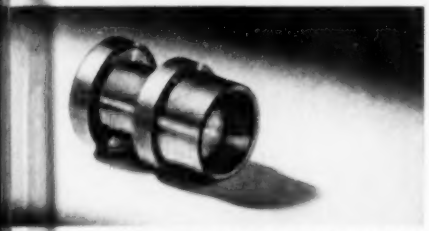
TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	2.9459	2.9470	47	11.8047	11.7935	84	20.6514	20.6365
11	3.1588	3.1592	48	12.0501	12.0387	85	20.8868	20.8718
12	3.4279	3.4277	49	12.2831	12.2716	86	21.1291	21.1141
13	3.6449	3.6440	50	12.5282	12.5165	87	21.3646	21.3495
14	3.9091	3.9076	51	12.7613	12.7495	88	21.6068	21.5917
15	4.1290	4.1270	52	13.0062	12.9943	89	21.8423	21.8271
16	4.3897	4.3871	53	13.2396	13.2275	90	22.0845	22.0693
17	4.6119	4.6088	54	13.4842	13.4720	91	22.3201	22.3048
18	4.8699	4.8663	55	13.7177	13.7054	92	22.5622	22.5446
19	5.0938	5.0898	56	13.9622	13.9497	93	22.7978	22.7824
20	5.3497	5.3452	57	14.1959	14.1833	94	23.0399	23.0244
21	5.5750	5.5677	58	14.4401	14.4274	95	23.2756	23.2600
22	5.8292	5.8239	59	14.6740	14.6612	96	23.5175	23.5019
23	6.0556	6.0476	60	14.9180	14.9051	97	23.7533	23.7377
24	6.3084	6.3024	61	15.1520	15.1390	98	23.9952	23.9795
25	6.5359	6.5272	62	15.3959	15.3827	99	24.2310	24.2153
26	6.7875	6.7808	63	15.6301	15.6169	100	24.4728	24.4570
27	7.0158	7.0088	64	15.8737	15.8604	101	24.7087	24.6929
28	7.2664	7.2591	65	16.1080	16.0947	102	24.9505	24.9346
29	7.4954	7.4879	66	16.3515	16.3381	103	25.1864	25.1705
30	7.7452	7.7373	67	16.5860	16.5724	104	25.4281	25.4121
31	7.9748	7.9667	68	16.8294	16.8157	105	25.6641	25.6481
32	8.2238	8.2155	69	17.0640	17.0502	106	25.9057	25.8897
33	8.4539	8.4454	70	17.3072	17.2933	107	26.1418	26.1257
34	8.7023	8.6935	71	17.5419	17.5279	108	26.3833	26.3672
35	8.9330	8.9240	72	17.7850	17.7710	109	26.6194	26.6032
36	9.1808	9.1716	73	18.0198	18.0057	110	26.8610	26.8447
37	9.4119	9.4024	74	18.2627	18.2486	111	27.0971	27.0808
38	9.6592	9.6495	75	18.4977	18.4834	112	27.3386	27.3223
39	9.8906	9.8808	76	18.7405	18.7262	113	27.5748	27.5541
40	10.1375	10.1274	77	18.9755	18.9611	114	27.8162	27.7998
41	10.3693	10.3591	78	19.2182	19.2038	115	28.0524	28.0360
42	10.6157	10.6053	79	19.4534	19.4388	116	28.2938	28.2773
43	10.8478	10.8373	80	19.6960	19.6814	117	28.5301	28.5136
44	11.0939	10.0831	81	19.9312	19.9165	118	28.7714	28.7549
45	11.3263	11.3154	82	20.1737	20.1589	119	29.0077	28.9911
46	11.5720	11.5609	83	20.4090	20.3942	120	29.2490	29.2324

ACTUAL PIN DIAMETER — 0.550 1 CP 14½° and 20° PA

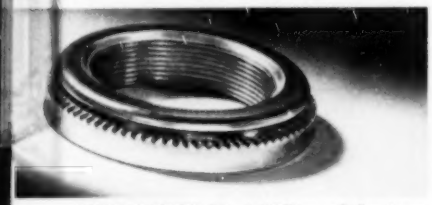
TEETH	14½°	20°	TEETH	14½°	20°	TEETH	14½°	20°
10	3.9278	3.9293	47	15.7392	15.7242	84	27.5344	27.5146
11	4.2117	4.2121	48	16.0664	16.0512	85	27.8483	27.8283
12	4.5705	4.5701	49	16.3770	16.3616	86	28.1714	28.1513
13	4.8597	4.8585	50	16.7038	16.6882	87	28.4853	28.4652
14	5.2120	5.2100	51	17.0146	16.9989	88	28.8083	28.7881
15	5.5052	5.5025	52	17.3411	17.3252	89	29.1223	29.1020
16	5.8528	5.8493	53	17.6522	17.6362	90	29.4452	29.4248
17	6.1490	6.1449	54	17.9784	17.9621	91	29.7593	29.7389
18	6.4930	6.4882	55	18.2898	18.2734	92	30.0821	30.0616
19	6.7915	6.7862	56	18.6157	18.5991	93	30.3962	30.3757
20	7.1327	7.1267	57	18.9273	18.9106	94	30.7189	30.6983
21	7.4331	7.4266	58	19.2529	19.2360	95	31.0332	31.0125
22	7.7720	7.7650	59	19.5648	19.5477	96	31.3558	31.3350
23	8.0739	8.0665	60	19.8901	19.8729	97	31.6701	31.6493
24	8.4110	8.4030	61	20.2022	20.1848	98	31.9927	31.9717
25	8.7142	8.7059	62	20.5272	20.5272	99	32.3071	32.2861
26	9.0497	9.0409	63	20.8395	20.8395	100	32.6295	32.6084
27	9.3541	9.3448	64	21.1643	21.1466	101	32.9440	32.9229
28	9.6882	9.6786	65	21.4768	21.4589	102	33.2663	33.2452
29	9.9935	9.9835	66	21.8014	21.7835	103	33.5809	33.5597
30	10.3266	10.3162	67	22.1141	22.0959	104	33.9032	33.8819
31	10.6327	10.6220	68	22.4385	22.4203	105	34.2178	34.1964
32	10.9647	10.9537	69	22.7513	22.7329	106	34.5400	34.5186
33	11.2716	11.2602	70	23.0756	23.0571	107	34.8547	34.8332
34	11.6028	11.5911	71	23.3885	23.3699	108	35.1768	35.1552
35	11.9103	11.8983	72	23.7126	23.6939	109	35.4916	35.4700
36	12.2407	12.2284	73	24.0257	24.0069	110	35.8136	35.7919
37	12.5488	12.5362	74	24.3496	24.3307	111	36.1285	36.1061
38	12.8785	12.8656	75	24.6628	24.6438	112	36.4504	36.4286
39	13.1871	13.1740	76	24.9866	24.9675	113	36.7653	36.7435
40	13.5162	13.5028	77	25.3000	25.2807	114	37.0872	37.0653
41	13.8253	13.8117	78	25.6236	25.6043	115	37.4022	37.3803
42	14.1539	14.1400	79	25.9371	25.9176	116	37.7240	37.7020
43	14.4634	14.4493	80	26.2606	26.2411	117	38.0390	38.0170
44	14.7914	14.7771	81	26.5741	26.5546	118	38.3608	38.3387
45	15.1013	15.0868	82	26.8975	26.8778	119	38.6758	38.6537
46	15.4289	15.4142	83	27.2112	27.1914	120	38.9975	38.9754



LOCK CYLINDER. Metal: 1¼" dia. brass • Machine: model 601 New Britain Gridley • Operations: *cross slide*—rough form, finish form, break down cut off, side mill, vertical end mill, final cut off; *tool slide*—face, drill offset hole, ream and counterbore offset hole, thread • Spindle Speed: 1,324 rpm • Feed: .006" per revolution • Tools: high-speed steel • Cycle Time: 7.3 seconds



CARPENTER'S PLANE PART. Metal: ⅞" B1113 steel • Machine: Brown & Sharpe Automatic Screw Machine • Operations: *front cross slide*—form; *rear cross slide*—cut off; *turret*—feed stock, spot drill, drill ⅜" hole, tap drill, reverse spindle and tap left-hand thread • Spindle Speed: 1,180 rpm • Feed: .0025" per revolution • Tools: high-speed steel • Cycle Time: 30 seconds



KNOB INSERT. Metal: 1⅝" round aluminum • Machine: model 61 1¼" New Britain Gridley • Operations: *cross slide*—form, knurl, cut off; *tool slide*—spot drill, tap, ream, recess • Spindle Speed: 1,600 rpm • Feed: .005" per revolution • Tools: high-speed steel • Cycle Time: 7 seconds

SUN OIL COMPANY, Dept. AM-8,
Philadelphia 3, Pa.

I am having trouble possibly caused by an inadequate cutting oil. I would like ☐ the services of a Sun representative; ☐ the booklet "Cutting and Grinding Facts."

Name _____

Title _____

Company _____

Street _____

City _____ Zone _____ State _____

MORE THAN 300 PARTS ARE MACHINED with the aid of *one* cutting oil for tools and hardware items made by Sargent & Co. Raw materials worked are: B1113 steel, 11ST-3 aluminum, ASTM-B140-46 Type B half-hard bronze, B16-46 brass, and Type 416 stainless steel. Stock ranges from ⅛" wire to 2" bars.

SINGLE GRADE OF SUNICUT REPLACES 4 CUTTING OILS

A good example of cutting-oil economy and efficiency is provided by Sargent & Co., well-known hardware and tool manufacturers. Their complete line requires the machining of more than 300 parts from a wide range of metals. A few years ago this company was using four different cutting oils, purchased in drums. By switching to a single product, Sunicut 11W, and buying it in bulk, Sargent has been able to effect an annual saving of about $3,000. All operations are performed as well as before, or better—and shop efficiency is up.

Sunicut 11W is a low-viscosity, dual-purpose cutting oil for automatics machining all nonferrous metals and free-machining steels such as B1112 or B1113. Its transparency permits quick and accurate miking. It will not stain brass or copper under normal conditions. It drains rapidly, minimizing carry-off. And its high lubricating and cooling properties aid in prolonging tool life and improving finishes. Moreover, it protects finished parts from rust and corrosion.

Other Sun cutting oils offer similar opportunities for improved operations and economy. For information about them, or the help of a Sun representative, use the coupon at the right.

SUN INDUSTRIAL PRODUCTS
SUN OIL COMPANY, PHILADELPHIA 3, PA. • SUN OIL COMPANY, LTD., TORONTO & MONTREAL

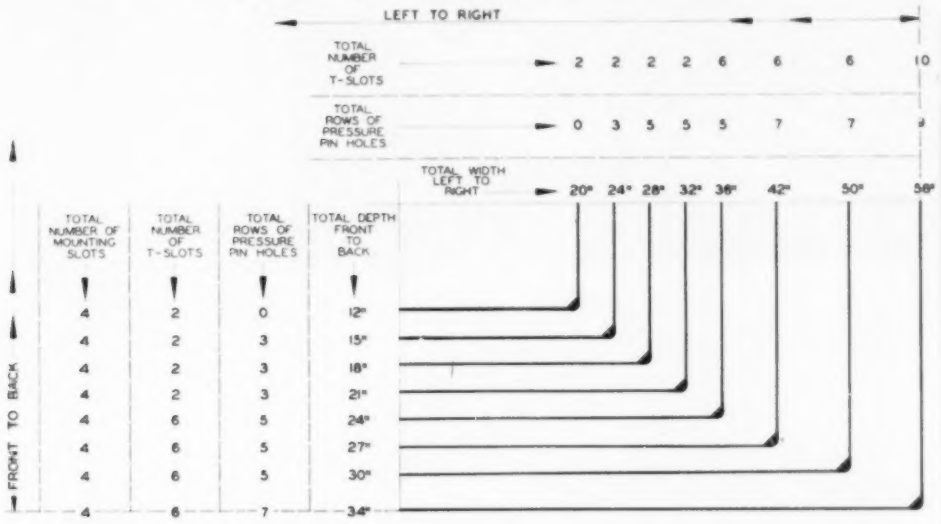
SUNOCO

JIC Open-Back Inclinable Presses

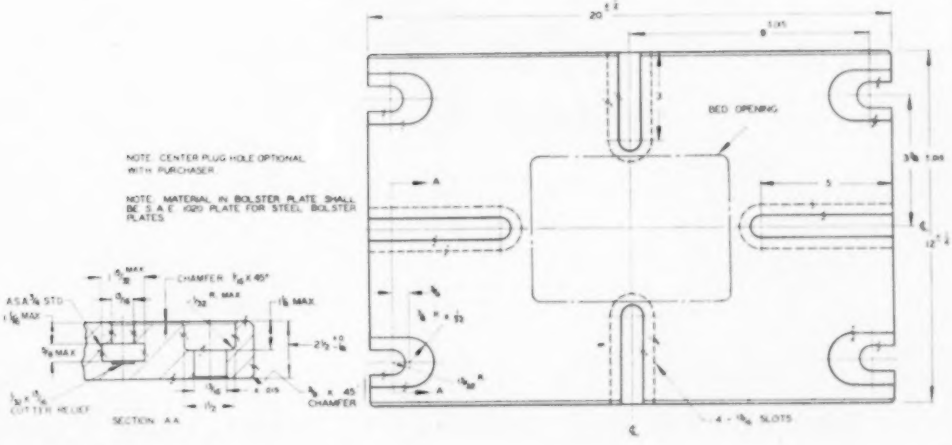
A standard developed by the Joint Industry Committee of the Automotive Industry

SELECTION CHART OF PRESS SIZES

Total number of mounting slots, T-slots and rows of pressure-holes in bolster plate


LEFT TO RIGHT
TOTAL NUMBER OF T-SLOTS
2 2 2 2 6 6 6 10
TOTAL ROWS OF PRESSURE PIN HOLES
0 3 5 5 5 7 7
TOTAL WIDTH LEFT TO RIGHT
20" 24" 28" 32" 36" 42" 50" 58"
FRONT TO BACK
TOTAL NUMBER OF MOUNTING SLOTS
TOTAL NUMBER OF T-SLOTS
TOTAL ROWS OF PRESSURE PIN HOLES
TOTAL DEPTH FRONT TO BACK
4 2 0 12"
4 2 3 15"
4 2 3 18"
4 2 3 21"
4 6 5 24"
4 6 5 27"
4 6 5 30"
4 6 7 34"

TYPICAL BOLSTER PLATE LAYOUT

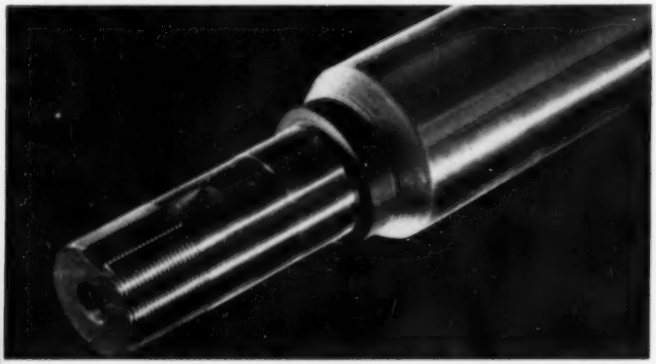

BED OPENING
NOTE: CENTER PLUG HOLE OPTIONAL WITH PURCHASER
NOTE: MATERIAL IN BOLSTER PLATE SHALL BE S.A.E. 1020 PLATE FOR STEEL BOLSTER PLATES
CHAMFER
ASA STD
SECTION AA
4 - SLOTS

Production News

ABOUT *Lusol* —THE ALL-CHEMICAL METAL-WORKING SOLUTION

FROM F. E. ANDERSON OIL COMPANY • PORTLAND, CONNECTICUT

4 TOOLS NOW DO THE WORK OF 18 WITH LUSOL IN THEIR MONARCH LATHES



This motor shaft is tough on tools. 18 a day were required until a 25:1 Lusol solution was put in each Monarch Lathe. Now they use only 4 tools per day for the same production and same fine finish.

Unusual? Not at all! Reports of greatly increased tool life, faster machining and better finishes are the usual thing where Lusol is at work. Plant managers tell us that, when they put Lusol in one machine, they soon have other operators asking for it. They like Lusol.

users say*

A TOOL BUILDER—"Drill lands and flats stay sharp on deep drilling with Lusol, where we used to have a lot of trouble."

A ROLL GRINDER—"Eight hours grinding time, required for finishing four diameters in a step roll, was cut to six hours by changing to Lusol. And they improved the finish."

A GEAR MAKER—"Only four pieces were formerly produced before milling cutters had to be ground. The solution smoked badly. After changing to Lusol, 8 and 9 pieces per cutter are obtained, and the work remains cool."

A DIESEL ENGINE BUILDER—"Two Minster punch presses automatically feed steel strip, blank and pierce pole-piece laminations for electrical generators. A small stream of Lusol flows onto the strip as it enters the dies. Used to smoke up the place, but there's none now, and the parts come out clean."

(*Case histories of Lusol at work)

FREE BOOK

Get complete facts about Lusol by writing for this 20-page booklet. It contains information on machine cleaning, maintenance of Lusol solutions, elimination of dermatitis and odor in machines, plus many case histories of Lusol at work. Write F. E. Anderson Oil Company. 218C, Portland, Conn.

Keep It Cool or Burn the Tool

A month of arguing since our first column appeared has not changed our opinion that the principal function of a cutting fluid is to cool the workpiece and tool, and that its lubricating function is secondary. We could cite various facts to support our thinking, but these two are enough as a starter: First, the cutting tool maintains its edge and life best when operating at low and constant temperatures. Second, the closer we can hold the machining operation to gauging temperature, the more accurate will be our work.

Cutting tools have certain qualities of hardness and resistance to abrasion, designed to lengthen their operating life. These qualities are usually measured at room temperatures and are certainly at their maximum at low temperatures. We have never been told that the hotter the tool edge the better, but that the cooler it can be maintained the longer the tool will last and cut clean. If this is true, it seems apparent that whatever we have to do to keep temperatures down should be done. If oil does this, let's use oil; if water does it, by all means let's work with water.

We have often wondered about the fact that metal parts are cut to one size and gauged at another. This doesn't seem to be good engineering, but it can't be helped when it is impossible to control operating temperatures. The hotter the tool, chips and workpiece run, the more variation there will be in size. How much simpler life would be if everything was at the same and constant temperature, say 70° or room temperature. We know this is impossible, but why not try to approach that condition as closely as possible? If oil holds temperatures down best, use oil; if water does it, use water.

You know other objections to heat—we have all had to put up with them for so long that we take them for granted. If nothing could be done about them, it would be one thing, but we believe that water can be made to do all the good things oil does and, in addition, lower the temperature of the entire machining operation, as oil can never hope to do.

None of the boys who are carrying the torch for oil will question that.

Next Month—"What do you mean, Lubrication?"

F. E. ANDERSON OIL COMPANY, PORTLAND, CONN.

TALKING SHOP

Steel Pen

WHO INVENTED the steel pen nib? Johann Janssen, official scrivener to the mayor of Aachen, claimed it in 1748. Samuel Harrison, a Birmingham (England) manufacturer, made a steel pen for Dr Joseph Priestley, the chemist and philosopher, in 1780. Among other men who've been given credit for the idea is, of course, James Watt (who didn't invent the steam engine either). In any case, a blacksmith named Fellows tried to claim the pen as his own along about 1800 — and his home town, Sedgley, in Staffordshire, promptly incorporated two steel pens in its seal to impress the fact on posterity. This was the routine followed in Switzerland when the legend of William Tell began to catch on.

Turbine Automobile

ROVER COMPANY of England produced a gas-turbine automobile which made 152 mph in Belgian trials. At that speed the car showed no sway or wobble. It looks like any special job but has only two controls—an accelerator and brake. Speed is controlled entirely by fuel flow and fuel can be gasoline, kerosene or diesel oil. The present car has a turbine in the rear, burns about twice as much fuel as a conventional engine of equivalent power. It is designed, however, for addition of a heat exchanger to bring the fuel economy to a better figure. Based on the Whittle design converted to a straight-through system, the turbine includes a single-stage centrifugal compressor, two combustion chambers, a compressor turbine and a power turbine. Turbine speed is 30,000 rpm, reduced to 5000 rpm for the drive. The 400-lb engine is 4 x 2½ x 2½ ft.

Airless Blast

FAIRFIELD MFG CO, Lafayette, Ind, has adapted a table-type blasting machine for combined cleaning and peening of gears. Scale from annealed rough forgings is removed by tumbling in two Wheelabrator airless blasting machines, while scale from heat treating is removed in the multi-table type machines. These units also have facilities for shot-peening gears, so they can handle gears up to 15 in. dia on a special attachment while large gears are handled on the standard work tables.

Work

"WORK is something that, when we have it, we wish we didn't; when we don't have it, we wish we did and the object of most of it is to be able to afford not to do any someday." —*Anonymous.*

Homer

IN 1867 the design of the new Pullman diner was subordinated to the wonder of the bill of fare which showed close attention to local produce. For the first time, travelers could eat at their leisure without bolting it down in a 20-min train stop. Here is a sample menu:

BILL OF FARE

Prairie Chicken	$1.00
Woodcock	$1.00
Pheasant	$1.00
Snipe, Quail, Golden Plover, Blue Winged Teal, *Each*	.75
Cold Tongue, Ham, and Corned Beef	.30
Venison	.60
Chicken, Whole	.75
Half Chicken	.50
Sirloin Steak	.50
Sardines, Lobster *and* Broiled Ham or Bacon	.40

48-in. Flycutter

MCKINLEY ALLOY CASTING CO, Fort Worth, Texas, is permanent-mold casting aluminum plates 4 x8 ft, in thicknesses from ½ to 2 in. These must be machined to a tolerance of plus or minus 0.005 in. Best solution thus far has been to use a planer-with a vertical-spindle miller head driving a flycutting head 49 in. in dia with 13 style "AR" carbide-tipped tools. Speed is 375 rpm, or about 5000 fpm, with feed 15 fpm. This gives a very smooth finished surface, well within tolerances on thicker plates. Plates under 1 in. thick, particularly those ½ in. thick, tend to bow up in the center from heat and thus throw thickness tolerance outside spec.

Hard-Faced Tool

NORFOLK & WESTERN RAILWAY COMPANY, at its Roanoke, Va, shops, has developed a new type of hard-faced tool. The shank is recessed as for carbide-tip brazing, then Stellite 98M2 alloy rod is put in by Heliarc welding. Tools are ground in the normal way. In tests, made by increasing cutting speeds to destruction, tools did not fail until they had cut 18 in., ⅛ in. deep, at 0.0105 ipr on 2-in. crs tubing, at 600 fpm. Tools now face and turn forged knuckle-pin bushings, taking a ⅜-in. turning cut or ¼-in. facing cut at 317 fpm and 0.006-ipr feed. They remove metal at the same speed as costlier carbides, and produce as many pieces per grind, removing 8 cu ipm of material. Other jobs include machining ten 2-ft x 1⅜-in.-dia SAE 3140 tie-bolts per grind at 2 cu ipm metal removal. Bolts are 265 to 285 Bhn.

Production Control

T S HARRISON, of the English lathe-building family, tells a story of the early days of the company, when machine-cut gears were introduced to replace cast gears. Extolling the virtues of the innovation to a customer, Mr Harrison's father pointed out how quietly the machine ran. His hearer was not impressed. "I want to hear the machine running when I'm sitting in the office," he insisted.

News of Metalworking

ASA OK's Lathe Standards

Accuracy standards for engine and toolroom lathes, based on individual domestic and existing European standards, have been accepted by the American Standards Association. The project was sponsored by NMTBA, and covers tolerances for lathe capacities from 12 to 72 in. in three groups.

Auto Air Conditioner

A sealed refrigeration unit mounted on a shelf inside the trunk space is the operating section of a new air conditioner announced by General Motors. It will be optional equipment on Cadillacs and Oldsmobiles for '53. Control is by a single knob on the dash. No change in external appearance of the car is required.

Aluminum Detergent

Magnesium, aluminum, and anodized aluminum are cleaned faster with powder detergent developed by Kelite Products, Inc. Soil, mill markings, and dirt are removed in a minute. The cleaner was developed originally for aircraft manufacturers.

Navy Conveyor

Ship-to-shore debarking will be easier and faster with a new belt conveyor capable of carrying 40 tons an hour. Belt is 22 in. wide, made in 20-ft sections, and operates at 33 fpm. Marines are testing it now for crated supplies.

Steel-Strike Impact on Defense Work Snowballs as Reserves Dry Up

WASHINGTON—Results of the steel strike on defense production haven't shown up until lately, but weapons makers have been telegraphing notices of production stoppages to the munitions board in ever-increasing numbers. Secretary Lovett decided to take the wraps off these reports to show just how bad the situation is:

- Military production has lost up to 30% of the year's total, and there is no chance of making this up.
- Aircraft will lose at least six months of production.
- Ammunition output will be down 50% to a level under the rate of use in Korea.
- All military production has lost all acceleration gained in the last year.
- Effects of the strike will be felt for at least a year.

Lovett, calling the strike a creeping catastrophe, said no enemy bombing raid could do as much damage. Any attempt to make up lost time and production will cut into civilian production drastically, particularly autos and refrigerators, whose steel allocations will be cut deeply.

EARLY SLACK

For the first few strike weeks, defense producers found they had more steel inventory than expected. When this ran out, the usual action was to cut shifts, give wholesale vacations, or cut to four- and six-hour shifts, hoping to hold the labor force together.

Each week produced word from Washington that the strike would break in a couple of days, but widespread plant closings came anyhow. Union - management - government agreement to open 14 selected steel plants never materialized, and no struck plants on the list ever opened their doors. Defense - Department and DPA expediters entered about 150 mills, got 25,000 tons of finished steel out, but this was less than 3% of monthly defense needs. During June, about 80,000 tons came from non-struck plants. Defense officials found that non-struck finishing capacity wasn't enough to take care of the unfinished steel piled up in struck mills.

FUTURE DANGERS

Biggest critical item is ammunition. Reserves are being eaten up at an alarming rate, and it will take at least two months of full-blast steel plant operation to take up slack in shell-steel inventories. June ammunition deliveries were high, but July deliveries dropped sharply.

Production of 57-mm ammunition for recoilless rifles was off 33% in July. Already, over half the production capacity for 155-mm- howitzer shells was shut down.

Aircraft is in equally bad shape. With parts producers shut down in large numbers, North American was (at press time) short 422 parts for the F-86 Sabre. Republic had run out of stainless sheet, rod, and bar for the F-84. Tailpipe-ring production for the F-84 stopped on July 21.

Navy suppliers are in no better shape. Closing reports in late July were double what they had been the previous week. Shipbuilding was then completely stopped, and Navy shells were not being produced.

Currently, it looks like the Pentagon will reshuffle schedules and recommend post-strike programs that will be only a little short of total industrial mobilization.

Starfire (Lockheed F-94C) is first US all-rocket-armed fighting plane. Ship features automatic radar target tracking and firing, and ribbon parachute in tail to slow plane on landing. Weight is 10 tons, length 41½ ft, span 37½ ft. Crew of two rides ejection seats

US Buying Abroad for NATO Swings into High Gear

WASHINGTON — A big year is ahead for off-shore procurement—where arms will be bought abroad for NATO forces. Contracts for a billion dollars' worth will be let this year. The money goes for ammunition, small arms, automotive equipment, small parts, and aircraft.

Marcel Darceau will produce the French Mystere jet interceptor out of $225 million in foreign-aid funds recently set aside for aircraft by US representatives. Another plane in the works is the British Vickers-Armstrong Swift, which will be built on the continent for NATO. A Netherlands firm will produce the airframe, and a Belgian plant will make the high-thrust Avon jet engine. British manufacturers are currently also negotiating to produce the Venom and Hunter jets on the continent.

IMPORTANT BUYS

Ammunition, especially for the 105-mm howitzer, is the biggest single item in short supply right now. US contracting officers are looking for suppliers who can produce the propellant (explosive) as well as the shell. Some Italian firms can make the shell, but not the charge, so German chemical industries may take up a large share of ammunition production in the future.

The Centurian tank is to be bought in England, which will give the British their share of the procurement funds. In addition, US contractors who are building air and military bases in Europe and Africa have orders to buy construction equipment in England.

Contracts made during the program will be let to manufacturers most able to produce the required materials, although there are slight political considerations. German weapons makers, for example, will not be given more business than that contracted for in France. No one country will get a lion's share.

EARLY PROCUREMENT

Fiscal 1952 was the first off-shore-procurement year, during which $700 million was spent in contracts —mainly in the last half of the year. Breakdown went this way: Belgium, $46 million; Denmark, $6 million, France, $335.5 million; Greece, $11 million; Italy, $129 million; Luxembourg, $300,000; Netherlands, $38 million, Norway, $6 million; United Kingdom, $70 million; and non-NATO countries, about $43 million. Germany got about $5 million of the non-NATO share. All but about 6% of the contracts went to nine NATO nations.

Buying practices are about normal, with Navy representatives in London making Naval purchases, Army buying through its Heidelburg headquarters, and Air Force buying through Rhine-Main at Frankfort.

Four basic principles guide buying: First, no contract for a weapon can be let to a foreign country if it violates security. Our latest rocket design and specifications, for example, cannot be given out.

Second, foreign production must not harm domestic production. If our own plants are standing idle, US will not buy abroad.

Third, no preferential prices are to be allowed, although this point is troublesome. Originally, 110% of US price was to be the limit—because US officers couldn't very well check European books, and some cost limit had to be set up. Unfortunately, the US price on some items varies considerably. A sample is one armament product being made at four US locations, where the prices varied 124%. The result is that US purchasers have to allow higher prices abroad.

Fourth, delivery dates must dovetail with NATO requirements, or else no contract is to be awarded.

Like US producers, European plants will get progress payments for work in place. They may also come in for facilities and services contracts. Defense Department has placed a $5-million order with Italy's Finn Mechanica for tooling work to make spare airframes for the F-84 (Republic). Chances are the entire plane will be turned out by the Italian firm in the future.

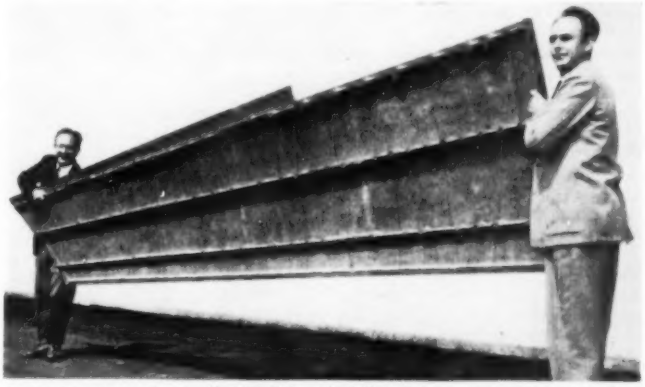
High-Temperature Formula

Materials for high-temperature operation may be developed faster in the future because of a new stress formula discovered by metallurgical engineers at General Electric Co. Adapted to a slide-rule calculator, the formula relates strength to time and temperature, allowing calculations of long-time strength under heat based on short-time tests.

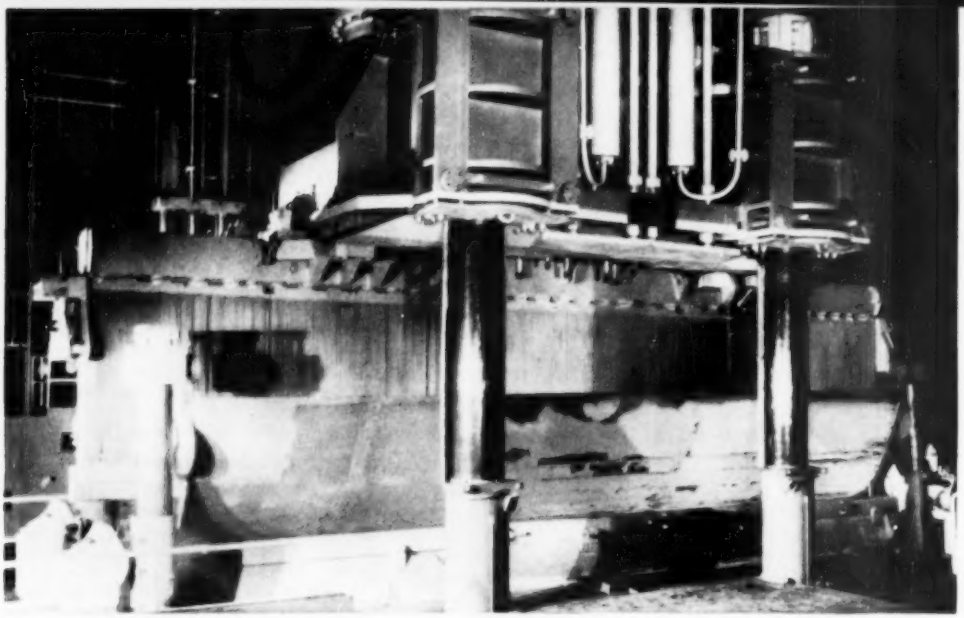
Two Timken Plants Struck To a Standstill

DETROIT—Operations are practically nonexistent at the Canton, Columbus, and Zanesville plants of Timken Roller Bearing Co, where about 13,000 workers have struck over a new contract to replace one that expired July 19. Main United Steelworker demand—a union shop.

According to A M Dozen, vice president in charge of manufacturing, few employees are trying to cross the heavy picket lines.



Cast magnesium wing section 16 ft long is believed largest cast aircraft surface ever produced. Northrup Aircraft, Alcoa, and USAF are cooperating in research to utilize lightness and strength of magnesium—in this case AZ-92 alloy



13-ton steel plate is hot-formed into drum section in 6500-ton hydraulic press by Babcock & Wilcox. Operator at console (lower right) wears mask and heat-resistant clothing as he controls shifting of plate under ram. New press also teams with push bench in method new to America to . . .

Pierce, Draw Hollow Steel Forgings to 13 Tons

BARBERTON, O—Heavy-wall steel forgings with ID from 8 to 26 in., wall thickness from ¾ to 4½ in., and lengths up to 22 ft, are being produced in a new plant here by a pierce-and-draw method that uses a graphite-grease lubricant.

Developed by Babcock & Wilcox primarily to produce headers for high-pressure steam-generating equipment, the method is expected to provide an economical means of producing accumulators, pressure vessels, heat exchangers, large bearing races, and other hollow forgings. Until now the headers have been produced by rolling and welding steel plate or by boring out a solid forging.

$2½-MILLION ITEM — In the $30 million expansion program that B&W has carried out since World War II, this addition to the Barberton Works is a $2½-million item. It includes a car furnace, a 6500-ton hydraulic press, and a 1200-ton push bench. Still to be added are a reheat furnace, conveyors, and a self-contained melting shop with arc furnace in which ingots of required analysis for each job will be produced.

The 6500-ton vertical hydraulic press was designed in cooperation with Hydropress and built by B&W at the Barberton Works. The capacity can be intensified to 8500 tons. Operating pressure is 3000 psi.

The movable platen is mounted on spherical bearing surfaces which permit a tilt of 11/16 in. at the outer edge to compensate for unequal loading of the bending beam. Hydraulically operated wedges lock the platen in the horizontal position when performing other operations.

HOW IT WORKS — Cropped ingots to 13 tons can be formed into hollow forgings. Ingots are heated to 2350 F in the car furnace, moved by crane to the press. After descaling, the ingot is placed vertically in a matrix mounted on rails in the pit. The blunt-nosed piercing punch is mounted centrally on the movable press platen and coated with a mixture of heavy grease and graphite. The stripper plate is suspended under the movable platen by chains, is self-clamping to matrix.

The matrix table is shifted under the press and ingot is pierced to within a few inches of the bottom. The polyhedric ingot expands to fill the cross section of the matrix and also extrudes up around the punch as the metal is displaced.

After stripping the punch from the ingot, the matrix table retracts to the rear of the press and a 500-ton ejection ram strips the ingot from the matrix. The pierced ingot is moved by crane to the adjacent push bench and placed on its side on one of the seven roller supports.

Roller supports have vertical adjustment of 25 in. to support work or mandrel as required. With support adjustment, the mandrel enters the ingot and pushes it through the first die ring.

Main ram of the push bench has 30-ft forward stroke so that in the early stage more than one die can be positioned along the frame. Ring dies are changed by crane as the operation continues.

Both mandrel and dies are lubricated with the mixture of heavy grease and graphite. About 20% reduction in area can be obtained on each pass, but the reduction in diameter on one pass never exceeds one third the diameter of the mandrel.

Following the last reduction of a series, a yoke is dropped over the

mandrel in front of the last die and the ram is retracted to strip the forging from the mandrel.

If too much reduction is attempted in one pass, the mandrel will push through the end of the work. If the work is not stripped from the mandrel before temperature has dropped to about 1800 F, it will freeze to the mandrel.

After the first series of reductions (following immediately on the piercing), the work is allowed to cool to room temperature and the surface is inspected for defects. Any inclusions or flaws are chipped out. Thereafter the work is returned to the furnace directly from the push bench until final size is reached.

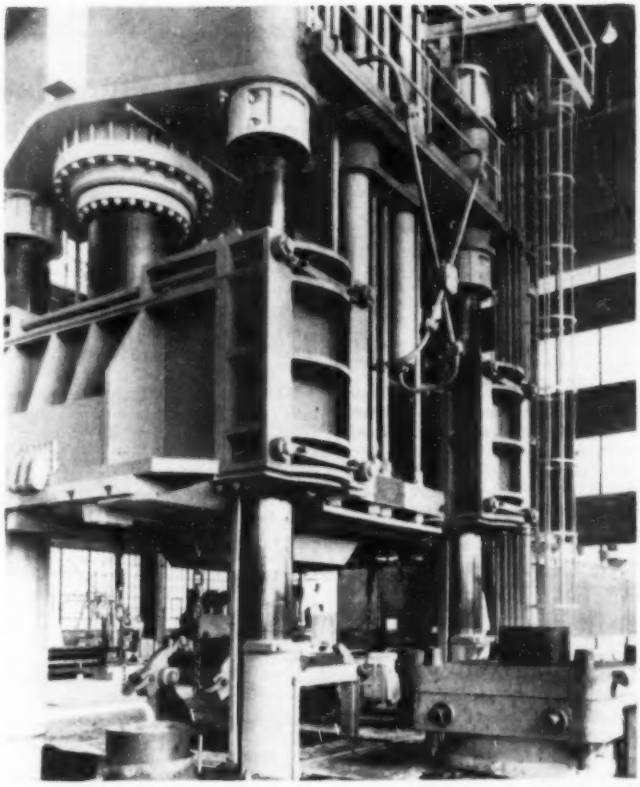
Mandrels are bolted to the main ram and can be changed in about 5 min. Mandrels and dies can be round or in simple shapes. In the few weeks that the equipment has been in operation, a variety of carbon and alloy steels, including stainless, have been forged with success.

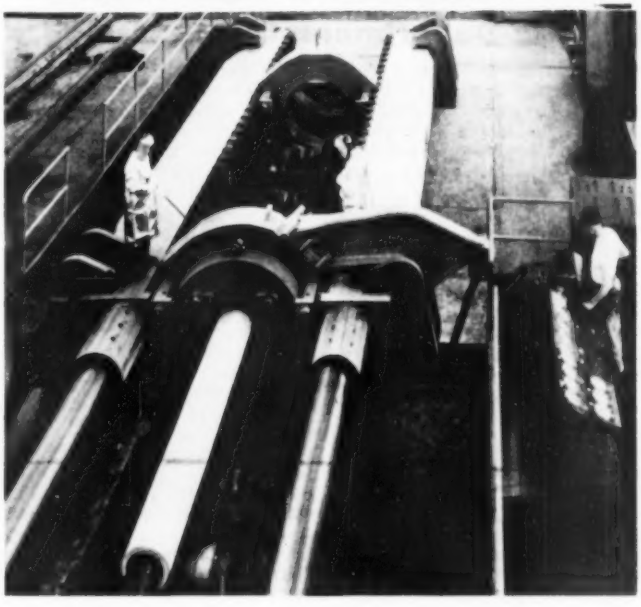
PLATE BENDING — A second shifting table equipped with 42-ft bending beams converts the vertical press to a press brake for forming unusually large plate sections. The largest job so far has been the forming of the drum halves for a Detroit Edison installation at St Clair, Mich. Each plate weighed 43 tons. Rolled by the Lukens Steel Co of 70,000-psi-tensile carbon steel, the plates were 10 x 36 ft x 6¼ in. thick, and are said to be the heaviest plate sections ever rolled.

The use of the large plates in making boilers and other pressure vessels eliminates several circumferential welds which take weeks to make and must be stress relieved and X-rayed.

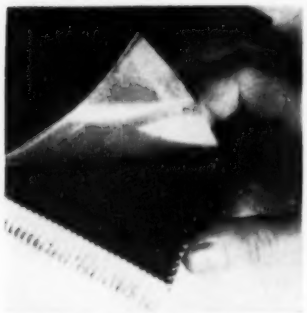
To handle work of such size, four manipulators are used, one at each corner of the table. These are trunnion-mounted cylinders, each of which will handle 35 tons. Any two can handle a 50-ton plate.

Plates up to about 2¾-in. thickness are formed cold. Heavier plates are rough-formed at forging temperature, then finish-formed cold. The same dies are used for both hot and cold forming.





Ingot piercing is first step in hollow forging (top). Ingot is placed in piercing pot which shifts under press where single stroke of punch pierces billet. Taken to push bench (bottom), ingot fits over mandrel; is pushed through die rings to forge desired size, shape



Aluminum honeycomb with ⅛-in. cells (1/16 in. smaller than any others available), is core for aircraft bulkheads and partitions. Weight in 0.001-in. stock is 4.6 lb per cu ft. Made by California Reinforced Plastics Co.

GM Reports Stable Employment

NEW YORK — Second-quarter employment by General Motors Corp did not fluctuate more than a few percentage points from 309,000. Maximum variation was 3½% above, and 2½% below that figure, up until the steel strike was felt in July. Average working hours were 39 for June '51 through June '52.

Industrial Plant Expansion For Specific Defense Items Needed

WASHINGTON—Next job facing defense officials after the steel crisis is how to get the kind of industrial plant facilities needed in case of all-out war.

New capacity already built or being built, about $22 billion worth, is more than enough to support our present limited mobilization program. But it is totally inadequate if a big war should come.

What worries Washington planners is that present incentives—five-year tax amortization, direct loans, loan guarantees — won't get much more of the additional capacity.

Two flaws are apparent: (1) There still are important gaps in our capacity to produce certain items (some steels, a few chemicals, certain metal-fabricating equipment for arms output); and (2) much of current expansion winds up as modernization—old plants being shut down as new ones are completed.

Most of the plant wanted by Defense Mobilization Director John R Steelman and Defense Production Administrator Henry H Fowler is of a type that wouldn't be run full blast—if at all—lacking a defense program of major proportions.

Mr Steelman and Mr Fowler have been talking about government-owned plants and plant additions. Congress has emphasized, however, that the government should build these only as a last resort, and that mobilizers must clear any such project with Congress in advance.

Defense officials are hoping to work out a deal with several industries for installation of special facilities in or adjacent to existing private plants, and lease such facilities to industry as long as defense orders could keep them busy; government would take them over and maintain them during idle periods. In this way, government facilities would be privately operated whenever production was needed.

Mr Steelman hopes to get the bulk of the facilities he wants by persuasion and a better deal on fast tax write-offs. But government ownership may in the end be the only answer on how to maintain operating conditions in an industry that is uneconomical in peacetime.

Defense-Department Check Writing Keeps Climbing Fast

WASHINGTON—At the beginning of the third year of Korean warfare, the totals for defense spending continue to grow. Including carry-over funds from fiscal 1951 of $9 billion, plus the $46.6-billion voted by Congress this year, plus arms aid for Europe, the Department of Defense has been given a bank account of about $168-billion.

To spend it all by June 30 of next year, Defense Department will have to write checks at a rate of $152-million per day for every day since the North Koreans marched on Seoul.

In terms of current spending rates, that figure is not far off base. Contract letting for munitions in June went to the unprecedented high of $8 billion to clear year-end funds. For July it dropped back to about $5-billion; during the Fall, it will get to about $6-billion.

But the measure of money going into industrial production is in deliveries of weapons and actual spending by the Department of Defense. July deliveries plus progress and advance payments totalled about $4-billion. It will climb this fall about another billion dollars, and sometime during the early Spring deliveries will pass contract letting.

The real core of contract letting is hard-goods procurement. That's the contracting done by the Defense Department for aircraft, ships, tanks, weapons, ammunition, production equipment, electronics, and similar goods. It represents nearly 90% of all procurement costs. During fiscal year 1952, the Department of Defense let contracts totalling about $45-billion. Hard goods alone took over $37-billion of this. Soft goods —clothing, subsistence, and petroleum—amounted to about $5-billion, and construction only half that much.

Since the outbreak of Korea, the Department of Defense has let contracts for nearly $110-billion, of which over $80-billion went to procurement. Of that, about $68-billion was for hard goods. About $8-billion of the hard-goods figure went into contracts for munitions let with US plants that will eventually go to NATO armies.

Defense appropriations, which this year came to $46-billion, do not include the cost of the Korean war. Fighting in the Orient is paid for out of current defense funds that are intended to build the armed forces up to strength. Consequently, Korean war costs erode the Joint Chiefs' planning. That's why the Defense Department will soon have to go to Congress for supplemental appropriations to take care of Korean attrition — mainly on munitions and equipment. A rough guess made by Pentagon brass is that the cost of Korean warfare—exclusive of troop and other maintenance costs which would be incurred anyway—will run about $3-billion per year for every year of the war thus far.

DPA Standardization Demand Throws AF and Navy into a Tizzy

WASHINGTON — Deputy Director William L Campbell of DPA, who is also chairman of the Aircraft Production Board, dropped a large bomb on July 9 by proposing that the services settle on a single plane for each specific battle mission. It means picking and getting all-out production on the best single fighter, interceptor, and light, medium, and heavy bombers.

The stinger in the idea is that dozens of contracts would have to be cancelled—and DPA has a ready-made list of just which aircraft it would like to see killed off. Reshuffling would approach in scope the recent "stretch-out," from which aircraft makers are just beginning to recover.

KING-SIZE PROD

Campbell, whom DPA administrator Henry H Fowler directed to dig a spur into the aircraft industry, doesn't actually expect to see all the proposed changes made. However, DPA isn't kidding about snapping the whip at the services for better planning and much more action. The report is documented.

One example of this is the coverage of the Air Force Mock-Up Boards of sixty or more members. These pass on new prototypes of aircraft, but are cited as cumbersome and time-wasting. Gen Hoyt Vandenberg had ordered a streamlining of these boards, but the job has never been finished. A horrible example is the fact that Navy has given higher rating to a piston-engine bomber than to the jet bomber that is to replace it.

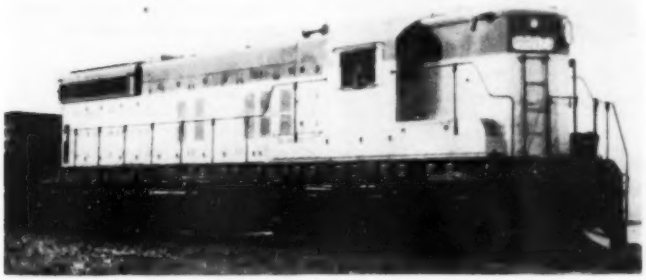
The report scores red-tape delays in getting contracts out, too. The prototype of Air Forces' Convair F-102 was tested and accepted in September '48. There aren't orders for more than a dozen of them on the books now. All that holds up orders is the fact that procurement officers haven't gotten around to them yet.

RECOMMENDED LIST

For fighters, the report pushes the F-86-F, North American Sabrejet. Large-scale production of the North American F-100 is still months away, but this should replace the F-86 when possible. Convair's delta-wing F-102 is the recommended interceptor, but the F-86-D, a fast-climbing Sabre, should be mass-produced until the F-102 is available. These plans would wash out the F-89 (Northrup) and F-94 (Lockheed), which are now planned for heavy production.

Drastic changes in production of Navy planes and jet engines were proposed. Campbell stated a check with manufacturers showed some makers of planes and engines to be discontinued could shift to preferred types.

Air Force and Navy officials were not willing to comment, and were horrified at the idea of publicity on some phases of the report. They can, and probably will, attack Campbell on the basis that full-scale adoption of the plan would throw everyone into confusion.



Railroads get knee-action springing with GM Diesel SD7 locomotive. Four large double-coil springs in each six-wheel truck distribute weight better. Locomotive, with three motors on each truck, has up to 90,000 lb tractive force, up 50% over older models

Plant Expansions

• **Allis-Chalmers** has purchased plant and assets of **Victor Electric Co**, Cincinnati, which will become part of A-C's Norwood works, and will handle Texrope Drive sales, engineering, and manufacturing. Allis-Chalmers is also negotiating for purchase of **LaPlante-Choate Mfg Co**, Cedar Rapids, which will become A-C's 15th plant.

• **Minneapolis-Honeywell Regulator Co's** Aeronautical Div is establishing a jet-engine laboratory to test controls for fuel flow, temperature, and tail cone. Lab will have capacity of 50,000 lbs of fuel an hour, believed largest in US.

• **Kropp Forge Co** has installed a 20-ton drop-forge hammer, completing $4½ million expansion program to handle aircraft work. Hammer weighs nearly a million pounds, will be used on titanium.

• **Westinghouse Electric Corp** has announced plans for an industrial-lighting plant at Vicksburg, Miss, to handle manufacturing and warehousing. It is part of current $296-million expansion program.

• **International Business Machines Corp** has added two wings to its Poughkeepsie plant for producing electronic computers and sights for USAF. Other defense equipment made there includes electrical systems for B-47 and B-36 bombers.

• **Leland Electric Co** will become a division of **American Machine and Foundry Co** through a stock-purchase deal.

Metalworking Abroad

(By McGraw-Hill World News)

India to Produce Tools—A factory fitted out with German-reparation machine tools and other machines bought in Europe will start production of drilling machines in Aug '53.

German Auto Exports—West German motor vehicles exported during the first quarter of '52 valued 214 million marks, up 30% over last year, and exceeding auto imports by 202 million.

Japan May Assemble Chryslers—A new firm, Metropolitan Agencies KK, will handle distribution of Chrysler cars in Japan, and may in the future import parts and assemble complete automobiles in Japan, using as much local materials and manpower as possible.

M-41 Amended To Allow Shipment Of Unrated Machine-Tool Orders

WASHINGTON—NPA has relaxed M-41 to permit shipment of unrated machine-tool orders as long as they do not interfere with scheduled deliveries of rated machines to defense contractors and defense-related industries.

Only exception is in the case of certain types of machine tools, and sizes, which still are critically short and must be reserved for rated customers. This list is appended to M-41 amendment as Exhibit D (published in *AM*—July 21 '52, p89).

The new directive will: (1) Assure a supply of machine tools for civilian purposes; (2) Help builders get back part of their overseas markets; (3) Bolster machine-tool production in spots where lack of defense business has been causing work to slacken.

The amendment makes clear that rated orders always will have the green light. Unrated orders can be sidetracked in favor of rated orders right up through the frozen period to the day of shipment from builders' plants.

AID FOR BUILDERS

Ralph S Howe, director of NPA's metalworking-equipment division, said the new directive will materially assist the sector of the industry that has little or no backlog of rated orders. New unrated business should bolster stability and keep all the industry at a high level. This will keep productive capacity available in case military demands for tools increase in the future.

Nine types of machines are listed: Boring, die-sinking, drilling, gear-cutting, grinding, lathes, millers, planers, and shapers.

Mr. Howe commented that the list is certainly not inflexible, and can be changed from month to month. Any item can be removed as the backlog of rated orders drops off on that type.

Authority to accept and ship unrated orders if they do not delay rated orders beyond required delivery dates will reduce the number of hardship appeals from the 300 US machine-tool builders.

This year, about two-thirds of the builders have applied in individual cases for relief, and these have been acted upon, even though NPA has had difficulty in being impartial.

Shipments of machines listed on exhibit D may be made against unrated orders only if special permission is received from NPA after justification has been proved.

Detachable counterweight on Yale fork lift truck compensates for heavy loads that exceed normal hoist or elevating capacity. Cast-iron 6000-lb weight is attached or removed in under a minute using another truck

Steel Workers Fail To Get Union Shop

WASHINGTON — CIO president Philip Murray suffered a severe defeat when he accepted the steel industry's terms almost without change to end the eight-weeks' steel strike. His capitulation came as result of pressure from President Truman to "get him off the hook." Settlement terms are these:

- Wage increase of 16¢ per hr plus fringe benefits of 5¢.
- Union security clause the same as one rejected by the union earlier.
- Wage increases retroactive to March 1 instead of March 16.
- Two-year contract proof against any strike except for general wage increase.

SIDE EFFECTS

End of the strike will stall the drive for union shops in aircraft, automotive, and other major industries for another two years — the contract runs out June 30, 1954, with wage-reopening clause for next June 30.

Industry also held off on premium pay for Sunday and the guaranteed annual wage, both of which WSB recommended for eventual acceptance.

The union-security clause works this way: Nonunion employees now working need not join, but new employees must sign a union membership application. After 15 days, and before 30 days, they may withdraw by written application to their employer. Otherwise, they become union members 30 days after hiring and must remain members. Present members must stay in the union. Any employee may escape during 15 days when the contract runs out.

Mr. Murray's acceptance, made at a White House meeting on the eve of President Truman's appearance at the Democratic convention, was only three days after the union's 170-man policy committee had rejected the industry's position in strong language.

Fringe benefits include company-paid vacations (3 weeks after 15 years' service), paid holidays (six), shift differential (6 and 9¢), and Sunday premium pay (time and a quarter).

Robert M Critchfield

Karl V Rohlen

Arch Morton

Harold A Strickland

Names in the News

Robert M Critchfield has been appointed general manager of the Pontiac Motor Div, General Motors Corp, suceeding the late **Arnold Lenz**. He was formerly assistant general manager of the Allison Div, Indianapolis. **Paul W Rhame**, general manager of the Rochester Products Div, succeeds Mr. Critchfield; **Howard W Brandt**, formerly director of industrial relations, takes over Mr Rhame's post.

C J Plisky has been appointed vice president in charge of production, Pressed Steel Car Co; he had formerly been vice president of the company's Unicel and Jahn Trailer Divs. Appointments of four general managers include: **L W April**, Solar-Sturges Mfg Div; **H A John**, Erie Mfg Div; **P A Larnino**, Unicel and Jahn Trailer Divs; **P W Jackson**, tank ordnance depot.

Robert Grorud has been appointed Alnico specialist for the Carboloy Dept, General Electric Co, Detroit; he will be located at the company's midwestern district headquarters, Chicago. Other appointments include: **V H Dearle**, manager, Michigan district, with headquarters at Detroit; **E R Almdale**, manager, Atlantic district, with headquarters at Newark, NJ.

John D McLellan has been named plant manager, Marion Electrical Instrument Co, Manchester, NH. Mr. McLellan was formerly vice president and general manager of J H Bunnell & Co. **Herbert L Schachat**, formerly Production Control Officer, US Signal Corps, Philadelphia, has been appointed manager of government sales for the company.

Karl V Rohlen has been named president of the Crane Packing Co, Chicago, succeeding **Frank E Payne**, elected chairman of the board. Mr Rohlen moves up from his post as vice president and general manager.

John F McDaniel has been named vice president and manager, marketing, of Hotpoint Co, Chicago; he was formerly manager of marketing. **Harold A Strickland**, formerly manager of engineering, was appointed vice president and manager, engineering.

F C Teckmyer, Jr has been appointed vice president and general sales manager of Ohio Gear Co. **Edward Beaumont**, former assistant plant supt, moves into Mr Teckmyer's post as general plant supt, and **Joseph Stich** succeeds Mr. Beaumont.

Richard T Johnstone has been appointed chief draftsman, Snyder Tool & Engrg Co, Detroit. Prior to joining the firm in 1950, Mr Johnstone was associated with LeMaire Tool & Mfg Co.

Charles R Crowder has been appointed executive vice president of Van Norman Co, Springfield, Mass. Associated with the organization for the past 24 years, Mr Crowder has served successively as sales promotion manager, sales manager, and vice president and director of sales of the Automotive Div.

Walter A St Clair has been named to head Hyster Co's newly-created national accounts office in Chicago. Mr St Clair has served in various capacities with the organization since 1945.

Arch Morton has resumed active management of Morton Machine Works, Ferndale, Mich, after a year's absence from the firm. **Paul W Taylor** has been appointed manager; he was formerly in charge of the Special Assignment Div of the Cadillac Tank Plant, Cleveland.

John A Goodwin has been named general manager, Morrison Engrg Corp. He had formerly been associated with Chase Brass & Copper Corp, and with the North American Mfg Co.

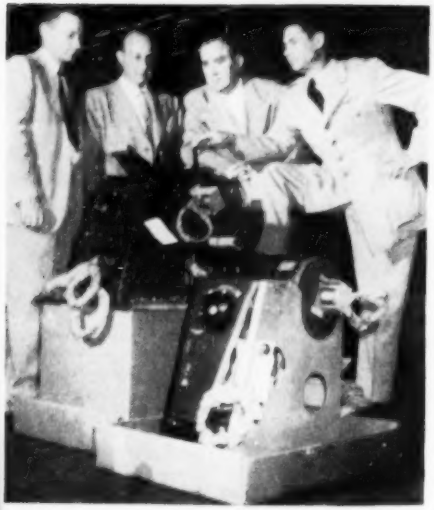
OBITUARIES

Arnold W Lenz, 64, general manager of the Pontiac Div, General Motors Corp, died in an automobile accident July 13 near Lapeer, Mich. Mr Lenz, a vice president of GM, had been with the organization for 34 years, and had headed the Pontiac Div for two years prior to his death.

Louis Charles Huck, 56, president of Huck Mfg Co, Detroit, died July 9. Mr Huck had been associated with General Motors Corp, the Clark Equipment Co, and in 1940 organized the Huck Mfg Co to adapt his blind riveting process to the aircraft industry.

William Luther Lewis, 68, president, Chicago Pneumatic Tool Co, died June 28 in New York. Mr Luther had served as vice president, secretary and treasurer of the company, and as president since 1946.

R C Brower, 60, secretary-treasurer and director of Timken Roller Bearing Co, died July 13 at Melvin Village, NH. Mr Brower joined the organization in 1923 as assistant general manager of the Service Sales Div; he had been a member of the board since 1936.



Pilot and co-pilot control stands for the B-47 stratojet bomber to be built at Lockheed Aircraft Corp's Marietta division are the first subcontracted parts for the plant. On hand for the official delivery are D J Haughton, second from right, vice president and general manager of the Lockheed's Georgia Div, and J W Alsdorf, president, Cory Corp, Chicago, second from left. Also shown are Col J P Walters, AF plant representative, and C H Roha, Lockheed subcontracts dept.

Ohio Industry Gets $122-Million Military Order Package

CLEVELAND — Northern Ohio industry gained $122,724,881 in Army Ordnance contracts according to figures announced during the first week of July. This represented the largest combined package of military orders placed at any one time since the Cleveland district agency accelerated its procurement program following the start of the Korean war.

The Cadillac tank plant here headed the list of 32 concerns with a contract extension of $52,794,588, boosting total orders received by the General Motors unit to more than $862,000,006.

Willys-Overland Motors, Inc, of Toledo was second on the list with a $31 million jeep order increase, raising its total to $400 million.

Much of the volume, reflecting the area's industrial diversification, as well as final fiscal-year procurement efforts of the Army office, went for parts and fittings for larger items already forming a part of military output.

In dollar volume the Cleveland district ranks third to Detroit and Chicago; the former area heads the list because of its automotive industry, and Chicago places second because of its vast size, its district boundary extending to the Rocky Mountains.

Single Westinghouse Order Subcontracted to 381 Firms

PITTSBURGH—A total of 381 firms participated directly in a single government contract awarded to Westinghouse Electric recently.

44% of the $16,965,288 electronic equipment contract was passed along to subcontractors and suppliers. 68.5% of this was allocated to large business and the remaining 31.5% went to firms employing less than 500 workers.

The largest subcontractor spent 41.6% of his total contract value as follows: 36.7% with large businesses; 63.3% with small firms. 254 large and small concerns aided this single subcontractor in meeting the requirements of his share of the total original contract.

Willys Fire Engines for Overseas

TOLEDO, Ohio—The US Army has approved the Willys-Overland jeep fire engine for overseas use.

First order, placed by the Philadelphia Corps of Engineers, is for 42 vehicles at $3690 each; total contract value is $162,000, including spare parts.

Like most of the company's fire engines now in use by municipalities throughout the country, the Army units will be equipped with foam extinguishers, ladders, and sirens.

Air-Conditioned Plane Carriers

YORK, Pa.—York Corp has received contracts to furnish additional air conditioning equipment for six US Navy aircraft carriers of the Essex class, the Intrepid, Hornet, Ticonderoga, Hancock, Lexington, and Randolph. Parts of the carriers had been previously air conditioned by the company.

Navy Pontoon Contract

RICHMOND, Calif. — A $1,853,000 contract for fabrication of 6900 steel pontoons for the US Navy has been awarded to the California Steel Products Co here.

Project will require 8600 tons of steel and employment of 100 additional workers.

The pontoons will be built for the Navy Construction Battalion Center at Port Heunemé in southern California, and will involve a large number of subcontracts.

Small Firms Hold Two-Thirds Midwest AF Prime Contracts

CHICAGO—Midwestern Air Force prime contractors currently hold more than $3 billion in defense contracts, according to the Midcentral Air Procurement District here. Values of AF contracts throughout the 11-state area of the district have nearly doubled during the last year; twelve months ago manufacturers held orders worth $1.6 billion, and in July 1950, contracts totaled only $185 million.

Two-thirds of the total number of contracts held at the present time are in the hands of small businesses, with more than 50% of total dollar values going to firms in this category.

New contract awards resulting from the national policy to extend the defense industrial base by bringing more small firms into the prime contracting category, as well as accelerated deliveries by manufacturers who have completed tooling in their plants and are now entering actual production stages, account for a rise in face values, with a more static hold on payments due.

LATEST DEFENSE CONTRACTS

ARMY ORDNANCE AWARDS

Aberdeen (Md.) Proving Ground

US Steel Co, Washington, DC—armor plate, exceeds $250,000.

Hadley Construction Co, Philadelphia, Pa.—controlled launching device, $329,000.

Midvale Co, Philadelphia, Pa.—armor plate, exceeds $250,000.

Henry Wild Surveying Instruments Supply Co of America, Inc, Brooklyn, NY—astronomical theodolites, exceeds $250,000.

Chicago Ordnance District

Langson Mfg Co, Chicago—percussion primers, $329,094.

Federal Cartridge Corp, Minneapolis, Minn.—cartridges, $438,981.

Studebaker Corp, South Bend, Ind.—trucks, $3,144,127.

Junior Toy Corp, Hammond, Ind.—liners for deep cavity shells, $808,411.

Bureau of Ordnance, Washington, DC

Arma Corp, Brooklyn, NY—computers, $4,598,079.

Norris-Thermador Corp, Vernon, Calif.—cartridge tanks, $2,228,194.

Ketay Mfg Corp, New York—synchros, $1,735,194.

Watson Elevator Co, Englewood, NJ—indicators, $249,117.

H A Sward Co, Inwood, LI, NY—ordnance disposal tools, $272,053.

Aluminum Specialty Co, Manitowoc, Wis.—belt links for ammo, $2,019,613.

Robertson Can Co, Springfield, Ohio—fuze containers, $113,219.

Austin Co, New York—indicators, $279,994.

Eclipse-Pioneer Div, Bendix Aviation Corp, Teterboro, NJ—synchros, $7,389,766.

Conver Steel & Wire Co, Inc, New York, NY—pallet adapters for projectiles and rocket heads, $170,000.

Monowatt Dept, General Electric Co, Providence, RI—electrical connectors, $595,719.

New York Ordnance District

Eclipse Pioneer Div, Bendix Aviation, Teterboro, NJ—generator assys, $4?1,044.

Mergenthaler Linotype Co, New York—periscopes, $1,676,459.

Daystrom, Inc, Elizabeth, NJ—telescope mounts, $1,721,450.

ARMY SIGNAL CORPS

Philadelphia Supply Agency

American Phenolic Corp, Chicago—antenna groups, $986,208.

Maspeth Telephone & Radio Co, Brooklyn, NY—switchboards, $226,538.

General Electric Co, Syracuse, NY—terminals, cabinets, $569,166.

Dynamic Electronics New York Inc, Forest Hills, LI, NY—test sets, $132,542.

Belmont Radio Corp, Chicago—amplifiers, $299,029.

Hallicrafters Co, Chicago—exciter units, $103,878.

Supreme, Inc, Greenwood, Miss.—tube tester, $304,158.

Crosley Div, AVCO Mfg. Co, Cincinnati, Ohio—radio sets, $616,281.

Kleinschmidt Labs, Inc, Deerfield, Ill.—reperforator transmitters, $1,093,000.

Stromberg-Carlson Co, Rochester, NY—switchboards, $271,746.

Kurz-Root Co, Appleton, Wis.—rotor-generators, $399,574.

Pioneer-Gen-E-Motor Corp, Chicago—dynamotors, $492,059.

Alliance Mfg Co, Alliance, Ohio—dynamotors, $400,584.

NAVY AWARDS

Bureau of Ships, Washington 25, DC

A O Smith Corp, Los Angeles, Calif—pumps, portable, $394,319.

Star-Kimble Motor Div of Miehle Printing Press & Mfg Co, Bloomfield, NJ—motor generators, $225,699.

National Acme Co, Cleveland, Ohio—motor controllers, $173,865.

Federal Telephone & Radio Corp, Clifton, NJ—transmitting sets, $2,451,507.

AIR FORCE AWARDS

Air Materiel Command, Dayton, Ohio

Allison Div, General Motors Corp, Indianapolis, Ind.—engines and spare parts, $3,000,000.

Herman-Nelson, American Filter Co, Moline, Ill.—heaters, $1,076,024.

Bulova Watch Co, New York—indicators, controls, $500,000.

Goodyear Tire & Rubber Co, Akron, Ohio—wheel & brake assy, $672,646.

General Electric Co, Dayton, Ohio—regulators, $717,339.

American Phenolic Corp, Chicago—connectors, $143,494.

Morrison Railway Supply Corp, Buffalo, NY—roller conveyors, $841,789.

F J Stoker Machine Co, Philadelphia, Pa.—pumps, $147,500.

Sperry Gyroscope Div, Sperry Corp, Great Neck, LI, NY—assemblies and sub-assemblies, $500,000.

Minneapolis-Honeywell Regulator Co, Minneapolis, Minn.—indicators, $1,500,000.

Aro Equipment Corp, Bryan, Ohio—oxygen regulator assy, $1,124,762.

Lord Mfg Co, Erie, Pa.—engine shock mounts, $140,094.

Western Electric Co, New York—communication carrier equipment, $300,000.

Fenwal, Inc, Ashland, Mass.—thermo switches, $108,982.

Mercury Trading Corp, Cincinnati, Ohio—radio receivers, $184,875.

P R Mallory & Co, Indianapolis, Ind.—bomb release controls, $139,091.

American Brake Shoe Co, Kellogg Div, Rochester, NY—air compressors, $187,519.

National Die Casting Co, Chicago—accelerometers, $300,000.

ARMY QUARTERMASTER CORP

Chicago Depot

Silent Glow Oil Burner Corp, Hartford, Conn.—tent heaters, $540,550.

McCord Corp, Detroit—steel helmets, $377,079.

American Gas Machine Co, Albert Lea, Minn.—stoves, $173,682.

Nesco, Inc, Chicago—stoves, $1,132,560.

Columbus Metal Products Inc, Columbus, Ohio—oil stove burners, $405,270.

E-Z Glider & Basket Co, Oklahoma City, Okla.—carts, nesting type, $113,520.

Keco Industries, Inc, Cincinnati, Ohio—refrigerator units, $299,100.

American Machine & Foundry Co, New York—bakery trailers, $337,902.

Aluminum Cooking Utensil, New Kensington, Pa.—parts for field range, $121,888.

Everlast Metal Products Corp, New York—flexible tubes, $375,000.

OTHER AWARDS

Armed Services Medical Procurement Agency, Brooklyn, NY

Burdick Corp, Milton, Wis—diathermy apparatus, short wave, $175,883.

Harris Hub Bed & Spring Co, Scranton, Pa.—bedside tables, cabinet type, $340,395.

Prometheus Electric Corp, New Rochelle, NY—mobile operating lamps, $213,189.

H Beker & Co, Inc, New York—scissors, $490,617.

Gusto & Stanek Cutlery, Newark, NJ—dissecting scissors, $253,581.

Surgical Instrument Corp, New York—dissecting scissors, $141,416.

Ohio Chemical & Surgical Equipment Co, Inc (Div of Air Reduction Co), Madison, Wis.—anesthesia apparatus, $674,479.

General Services Administration, Washington, DC

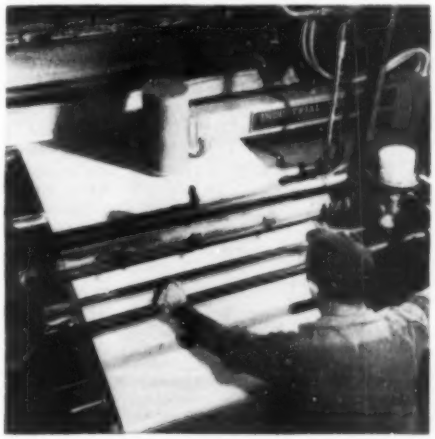
Salyers Equipment Co, Los Angeles—electric generators, $229,350.

LeRoi Equipment Corp, Woodside, LI, NY—generator sets, $173,800.

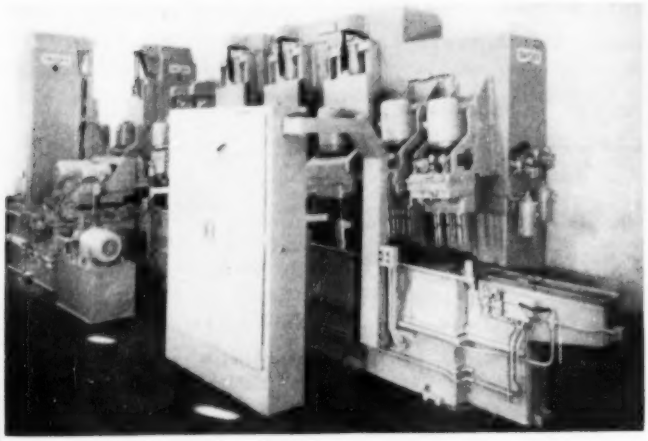
Willys-Overland Motors, Inc, Toledo, Ohio—light trucks, $147,426.

Proportioneers, Inc, Providence, RI—water purification units & pumps, $321,200.

New production technique installed at Carborundum Co's Coated Products Div plant at Niagara Falls is the first of its kind in the coated products industry. Thickness and density of adhesive, abrasive, and final adhesive coat can be controlled with an accuracy within 1%. Here the second of five Accuray nuclear gages, actuated by radioisotopes, measures weight of backing plus weight of adhesive as material moves through coating machine. Abrasive material (background) streams onto adhesive-coated backing.



New Shop Equipment



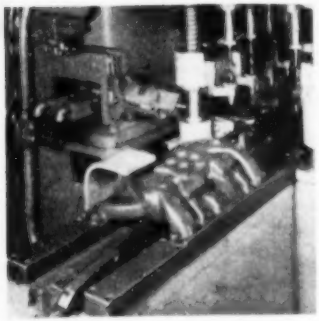
Rough-cast manifold is centered at Station 2 with hydraulically actuated slide having self-centering jaws that contact surfaces in center of casting. At this position, two locating holes are drilled and reamed for use at later stations

Sixteen-station transfer machine equipped with 76 cutting tools operates on 21-sec cycle to finish 136 intake manifold castings per hr at 80% efficiency. Unit is fully automatic

Drum Switch Sets Snyder Transfer Machine

Three similar cast-iron intake manifolds, each requiring different machining operations, can be produced in a line-index transfer machine without changing or resetting tools. The only adjustment needed when changing over to a different manifold is the turning of a drum control switch.

It has a total of 16 stations, one each for loading and unloading, and the other 14 for the several machining operations. Production is estimated at 136 pieces per hour (for either of the different manifolds) when the machine is operated at 80% efficiency.



Loading station has clearance bracket which prevents casting from being positioned incorrectly. Transfer slide has counterweighted latches which move castings between stations

Since the castings are of duplicate design except for the carburetor mounting pads, some heads in the machine can be used without readjustment for all three castings. For example, Stations 2, 3, 4 and 5 drill and spot face hold-down bolt holes, and rough and finish mill carburetor pad faces and two small bosses on all castings without change of setup.

But machining of the carburetor pads is another matter. Two of the manifolds have only two venturi holes (but of different sizes) in pads of the same size, while the third has four venturi holes in a larger pad. So different heads are needed for drilling and tapping these carburetor pads. Those heads not needed for machining the carburetor pad of that particular style manifold casting are locked out and do not operate when the drum switch is positioned.

Operations performed on the carburetor pads (there are 5 previous operations) are as follows—parts *A* and *B* each have two venturi holes in the pad, part *C* has four such holes:

6. Drill four holes in carburetor mounting pad and three other holes in top of casting—parts *A* and *B* only. This station is locked out when Station 7 is used.

7. Drill four holes in carburetor mounting pad and three other holes in top of casting—part *C* only. This station is locked out when Station 6 is used.

8. Core drill one of two venturi holes in carburetor mounting pad, countersink two holes, and spot face one hole—part *A* only. Stations 8 and 9 are under same duplex drilling head, which is locked out when Stations 10 and 11, or Stations 12 and 13, are in use.

9. Core drill other venturi hole in carburetor mounting pad, and countersink five other holes—part *A* only.

10. Duplicate of Station 8, but for part *B* only.

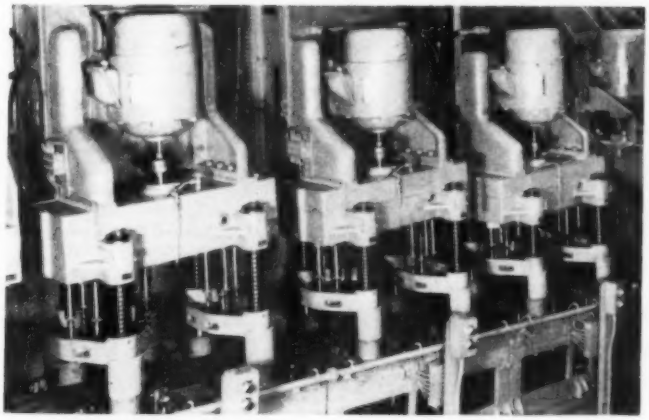
11. Duplicate of Station 9, but for part *B* only. Stations 10 and 11 are locked out when Stations 8 and 9, or Stations 12 and 13, are in use.

12. Core drill two of four venturi holes in carburetor mounting pad, countersink four holes, and spotface one hole—part *C* only. Stations 12 and 13 are under same duplex drilling head, which is locked out when Stations 8 and 9, or Stations 10 and 11, are in use

13. Core drill other two venturi holes in carburetor mounting pad, countersink three other holes—part *C* only.

14. Tap six 5/16-in.-18 holes and

Materials and Parts



Only one of these three duplex drilling units are made operative for each of the manifolds. The two tapping heads to the left of these stations, as well as two drilling heads to the left (not shown), also are controlled by the drum switch

one ⅛-in. pipe tap hole—parts *A* and *B* only. Station 14 is locked out when Station 15 is in use.

15. Tap six 5/16-in.-18 holes and one ⅛-in. pipe tap hole—part *C* only. Station 15 is locked out when Station 14 is in use.

16. Unload finished manifold to adjacent conveyor.

All taps at Stations 14 and 15 are lubricated with a Norgren oil fog system, but only when in use. Solenoid valves are actuated by limit switches to operate either of the two fog units as the tapping head to which it is connected is fed downward.

Similarly, solenoid valves are actuated during the workpiece transfer cycle of the machine, to admit air to pipe lines leading to nozzles at each locating pin in the various locating and clamping positions. This insures against chips lodging around the locating pins, causing misalignment of the parts when they are pulled down against stops by the hydraulically-actuated clamps.

There are 14 electric motors used on the machine, 11 for driving machine heads, the other three for driving the hydraulic pumps at each of the three hydraulic power units shown. Each of the three hydraulic circuits, used for machine head feeds and for the power clamps at each station, operates at 500-psi pressure.

Control of the machine is centered in a pushbutton panel at the loading end of the machine.

Snyder Tool & Engineering Co, 3400 E. Lafayette Ave, Detroit 7, Mich.

Coating for steel sheets can be used as a primer or finish—in any color desired. It is claimed to be harder and more durable than any other known method of protecting steel against corrosion and heat. After both sides of either a cold- or hot-rolled sheet have been degreased, pickled, and phosphatized, they are heated after which Leafcote is bonded and baked on. The steel sheet can be drawn and formed without cracking or peeling the coating.

Mid-America Steel Warehouse, Inc, Chicago, Ill.

Oil-free dry bearing material requires no lubrication and is claimed to outperform plastic, metallic, and other bearing materials. Known as Rulon, it withstands temperatures up to 500 F, is chemically inert, and cannot be attacked by any process material.

Dixon Lubricating Saddle Co, Bristol, R. I.

...INCLUDING

Three-station boring machine uses cams to control both cutting speed and stroke.....page 156

Chamfering and deburring of zerol bevel gears is done by four form tools actuated by a rocker-arm motion .....page 156

Horizontal broaching machine, hydraulically controlled, cycles at 700 strokes per hr.....page 157

Air-powered drill unit has full control of stroke, feed, and speed .....page 158

Cup grinding wheel has a hard shell of resin-bonded abrasive which resists rounding of cutting edge .....page 162

Internal and face grinding are done in single work setting on German-made machine.page 164

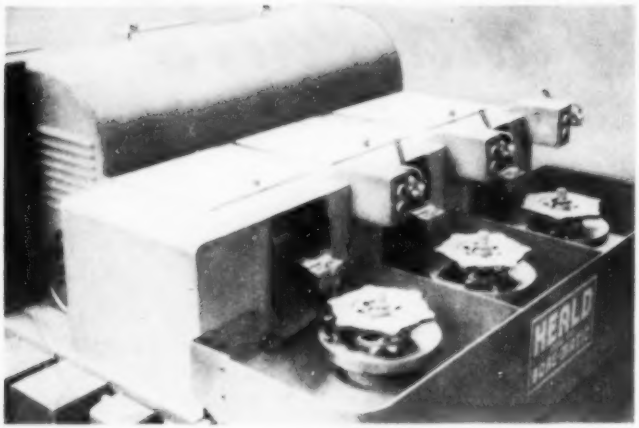
Hold down on squaring shears has individual compression springs to compensate for varying stock thicknesses .....page 172

Lever-arm creep tester to check jet-engine alloys uses a power-operated lifting mechanism for the weights.....page 178

... and in Aug. 18

Straightening press features optional two-speed ram travel in both longitudinal and transverse directions

High-speed stream of abrasive, directed through a tungsten-carbide nozzle, cuts extra-hard metal, deburrs, and polishes



Cams Control Cutting Speed and Stroke on 3-Station Bore-Matic

The Model-243 Bore-Matic does multiple precision facing and step-facing operations on clutch plates, bell housings, flywheel assemblies, and other similar parts. The three stations may be set up for simultaneous or progressive production runs and loading on any station may be done with others operating.

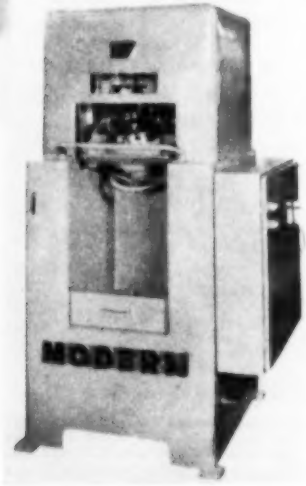
Cams operating the toolslide control the cutting speed as well as the stroke, thus, depending upon the number of cams provided, a wide range of cycling is available.

Tool adjustment is accomplished by setting index-marked screws on the top of the toolblocks and may be done while other stations are operating.

The rotating air-operated fixtures are mounted on vertically positioned boring heads with fixture-clamp levers adjacent to each push-button control station.

Chip disposal is by worm or screw conveyor — the chips are deposited in a pan at the right side of the machine. Guards around the toolslide prevent chips from entering the cam-operating section and access doors at the top facilitate periodic inspections.

The Heald Machine Co, Worcester 6, Mass.



Machine Chamfers Heel and Toe Of Zerol Bevel Gears

The Model BM-2055 Burr-Master can chamfer and deburr tooth edges at both heel and toe of an 8-in.-dia. 99-tooth, 12.53-pitch zerol bevel reduction gear in 30-sec cutting time.

Pressing the cycle start button causes the work to be brought into cutting position by pneumatic cylinder. The teeth are then chamfered by rotating the work in time relation to the cutting action of four dovetailed HSS form tools. When the cutting cycle is completed, the work is lowered into unloading position automatically.

The four form tools are actuated by a combination rocker-arm motion that gives a generated cutting action. The edges are chamfered well around the root of the tooth.

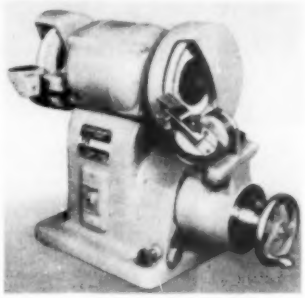
The zerol bevel gear is located in the fixture by a pilot. Three spring-loaded locators spaced at 120° on the outside of the fixture are provided for radial location. The part is positioned by depressing any of the locators into a tooth space.

Clamping the work in the fixture is accomplished by sliding a C-washer over a draw bar and turning a handwheel.

The head of the machine is enclosed during operation by a guard having sliding doors—for both operator safety and chip control.

Other features include: clutch to prevent damage to parts in case of overloads, precision index mechanism that runs in oil bath, and all electrical equipment built to JIC.

Modern Industrial Engineering Co, 14230 Birwood, Detroit 4, Mich.



Die-Chaser Sharpening Machine

This bench machine allows heavier, more-expensive machine tools to be used for their intended purposes. Equipped with the J&L chaser grinding fixtures and adapters, it can be used on both tangent and radial chasers. Adapters for J&L chasers are available from stock, and other make adapters can be easily applied to the fixture.

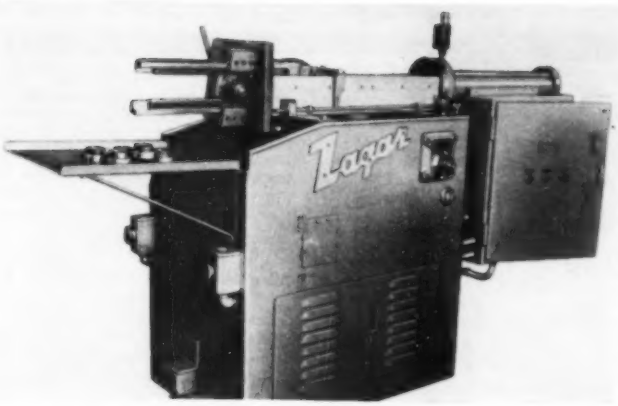
The machine is equipped with all necessary stops and controls—it will duplicate desired grinds repeatedly.

It is claimed to be easy to operate and bench space is only 14x28 in.

Jones & Lamson Machine Co, Springfield, Vt.

Surface pyrometer is available with a selection of 14 different thermocouples and extension arms to meet every surface and sub-surface temp-measuring need. It can be equipped with a quick-change connector which premits the thermocouples to be quickly snapped and locked to the extension arms without any tightening needed.

Pyrometer Instrument Co, Bergenfield, N. J.



Horizontal Broaching Machine Cycles at 700 Strokes per Hr

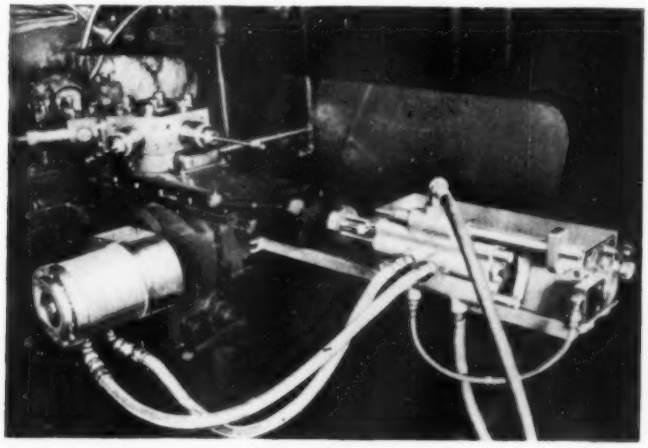
This 20-in. horizontal broaching machine is claimed to be the fastest available in both operation and strokes per hr.

The machine is started by pedal, which allows both hands free to handle the work. The pedal is double-sided so that it can be operated on either machine side. Two emergency stop switches can be operated by knee or hand.

Other features: Hydraulically controlled and electrically operated through a system built to JIC standards. A selector switch gives a choice of automatic return stroke or conventional broaching stroke which stops at end of cut. The coolant system, built integral with the machine, pumps either light or heavy cutting solvents.

Maximum pull is 6000 lb; max. feed stroke is variable between 2 and 27 fpm; full return stroke of 20 in. requires 1.5 sec. Floor space is 3x9 ft. Cycles at 700 strokes per hr.

Zagar Tool, Inc, 2400 Lakeland Blvd, Cleveland 23, Ohio



Viking Hydraulic Turret Drive Powers Hand Turret Lathes

Attachment is designed for lathes with 6-station ram turrtes and with bar capacity to 2½ in. It provides a continuous or interrupted cycle to speed short- or long-run work.

The complete unit consists of ¾-hp motor, two pumps, reservoir, fluid motor, control valves, and connections. Pumps, motor, and reservoir fit under the machine end. The fluid motor attaches to the turret pilot-wheel shaft. The control body is compact, small in size—mounts on the turret end. The entire assembly requires no additional floor space. Hydraulic settings and circuits are simple and easily understood — installation on a standard machine requires less than four hours.

Automatic individual cycles and feed rates can be quickly and easily set to suit different operations in six or fewer number of turret positions, by individual circuit control rods and adjustable dogs. Individual cycles for each of the six positions can be set for rapid approach, dwell, infinite adjustable feed, and quick return.

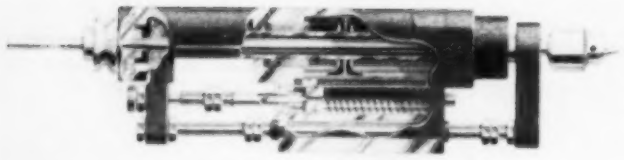
Once set up, the operator simply starts the cycle with a hand lever. Stop is automatic after any series of operations. While the drive is in automatic the operator is free to inspect and prepare the next piece for chucking.

Viking Industries, Rockford, Ill.

Fractional-Hp Vari-Speed Motor

VA-C Varidrive is a single-phase variable speed motor made in ¼, 1/3, ½, and ¾ hp, using 110 or 220 v. Speeds are provided in a 10:1 ratio with the range from 4 to 10,000 rpm; they can be varied, without stopping the motor, by turning a control dial. Necessity for an external speed changing device or gear box is eliminated; the unit occupies little more room than a standard fixed-speed motor.

US Electrical Motors Inc, Box 2058, Los Angeles 54, Calif.



Control of Stroke and Feed On Gurmendi Drill Unit

The Gurmendi Air Drill Unit has the following features:

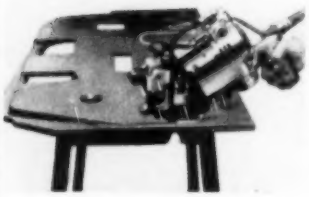
1. Universal application in setup and power choice.
2. Full control of stroke, feed, and speed.
3. Positive adjustment for forward and return strokes.
4. Simplicity of operation and maintenance.
5. Low original cost (sells for $98.75 complete).

The unit uses a hydraulic monitor which results in quick approach to the work, and positive adjustment rate through the work.

The unit has positive stop adjustment on both forward and return strokes. Stroke is 2 in. with controlled feed of 1¼ in. Control of the feeding rate is taken over at any desired point in the spindle travel by the hydraulic monitor—giving a fully-adjustable feed rate.

Spindle speed is up to 12,000 rpm. The hydraulic monitor is an essentially air-hydraulic cylinder combination. The spindle is equipped with a ¼-in.-capacity Jacobs chuck. Oilite bearings are used on piston rod.

Alkon Products Corp, 698 East 142nd Street, New York 54, N.Y.



Small Dust Collector Has Cyclone Separator

The Model 520 DUSTKOP requires only 18x23-in. floor space and 25-in. over-all height, yet develops a rated 525 cfm at a static suction of 2-in. water lift. Available with single or double inlet connections, it recirculates the cleaned air within the working space.

It has a paddle-wheel, self-clearing fan direct driven by a 1/3-hp continuous-duty motor, the latter for operation on either 110-v, one-phase; or 220/400-v, three-phase, 60-cycle power. The built-in cyclone separator removes all dust down to 20-micron size and precipitates them into the dust storage compartment, which comprises the base. The rest of the dusts are removed by spun-glass filter which comprises the top of the unit. Replacement of the filter is required at only prolonged intervals because of the efficient cyclone separator. In addition, a hand-crank permits periodic shake-down of the filter. The unit is available with single 5-in., single 4-in., or double 3-in. inlet connections.

Aget-Detroit Co., Ann Arbor, Mich.

Acipco Centrifugal-Cast Tubing

Made in sizes ranging from 2 to 50 in. OD, with wall thicknesses from ¼ to 4 in., Acipco tubes can be had in lengths up to 16 ft.

All ASTM, AMS, Federal, ABS, ACI, AISI, and other U. S. Government specifications are easily met, as the tubing is made in any standard or non-standard analysis.

Applications such as shaft rolls, retorts, hydraulic cylinders, and other heavy-wall applications can be met with the tubing.

Peter A Frasse and Co, Inc, 17 Grand St, New York 13, N. Y.

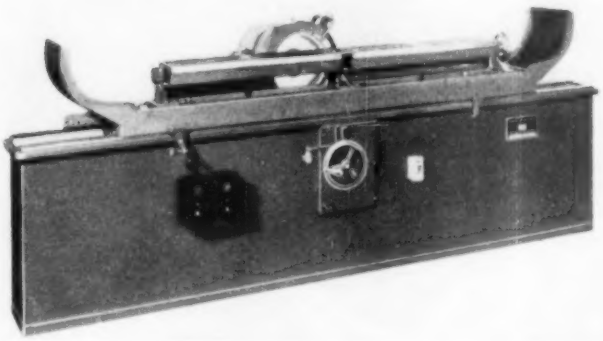
Torch Set at Any Angle On Hand-Operated Flame Cutter

Hand-operated flame-cutting machine which weighs only 19 lb will do plate cutting in thicknesses from 5/64 to 2¼ in.

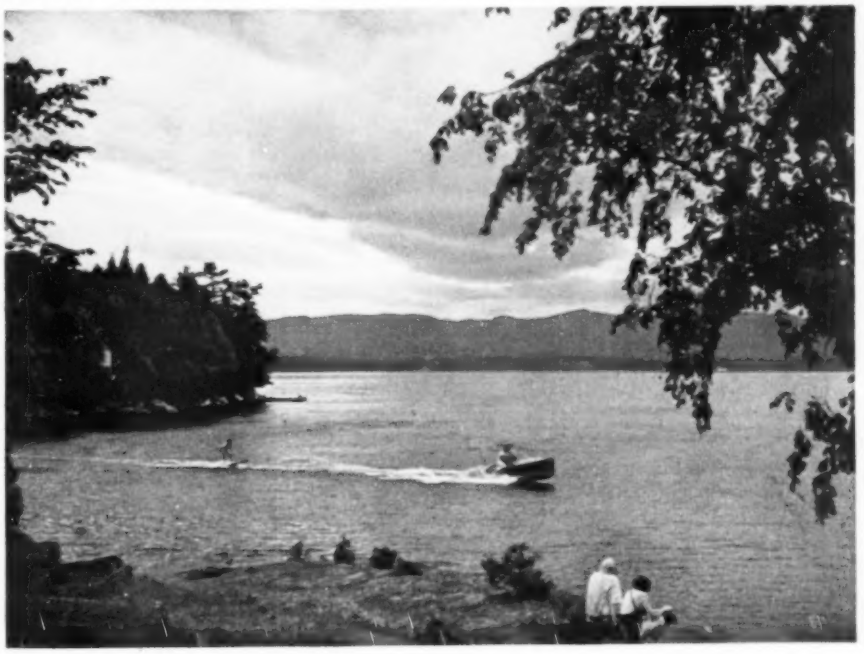
Using an oxy-acetylene flame, it will do straight cutting, I-beam cutting, circle cutting to a radius of 1 in., and bevel cutting. The torch can be set at any angle for bevel cutting. Graduations and 5-deg increments are scribed in the holder body.

Known as the Cadet, it has a self-contained, electrically-driven motor. The table gives proper selection of cutting speeds, oxygen pressure, and torch tips—even the correct distance between tips and work. All parts are easily accessible and interchangeable. The torch is adjustable both vertically and horizontally.

American Pullmax Co Inc, 2455 N Sheffield Ave, Chicago 14, Ill.



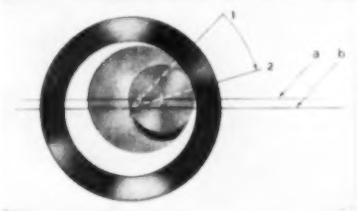
AUTOMATIC KNIFE GRINDER has electric table drive, including special control switches and 1½-hp reversing motor. Table speeds are variable and table reversals are smooth and shock free. All grinding pressures are absorbed by the heavy cabinet base through a combination of flat and angled V-ways. The wheel is a 14-in.-dia segmental and is moved to the work automatically in desired increments. The knife bar is of the box type with two faces to handle either thick or thin knives. Any angles can be easily set for bevel grinding. Available in 6 standard sizes to handle knives up to 60, 66, 72, 90, 102, and 110 in. in length. — *Samuel C Rogers & Co, 183-205 Dutton Ave, Buffalo 11, N.Y.*



What's in Vermont this month?

If the internal grinder is to generate straight holes within precision tolerances, on a production basis, the various elements of the machine must be properly aligned. The axis of the work, the axis of the wheel, and the diamond must be in a plane parallel with both traverse and cross feed ways. Then the direction of feed will coincide with the line from the center of the workpiece to the point of contact between the wheel and the work.

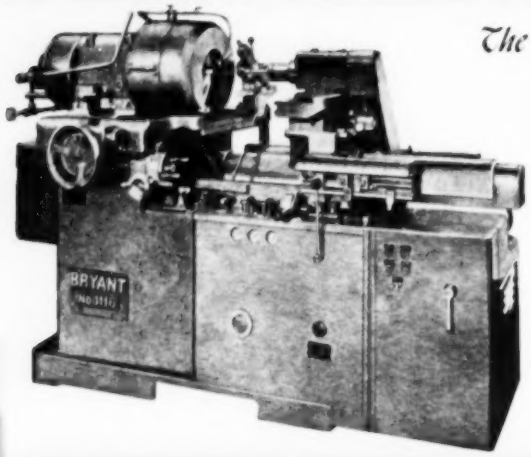
In the illustration, these requirements are not met because the work center "b" is below plane "a", established by wheel axis and diamond. The drawing shows the wheel at its largest diameter (new), and also at its smallest diameter (worn). The distance between center heights "a" and "b" is constant during the life of the wheel. With the new wheel, the plane established by the wheel and work axes (plane 1) shows the line of contact to be high. With the worn wheel (plane 2), the line of contact has moved down so that it is approaching the direction of feed. As the line of contact drops from 1 to 2, due to wheel wear, there will be a constant increase in the amount of stock removed per graduation on the feed wheel, but at no time will the stock removal be as great as that indicated by these graduations. This is one of the reasons that some internal grinders, when set up for diamond sizing, will not hold size during the life of a wheel. The only possible



remedy for this error is to bring the axis of the work into the plane established by the wheel axis and diamond. Stock removal will then be uniform regardless of wheel diameter.

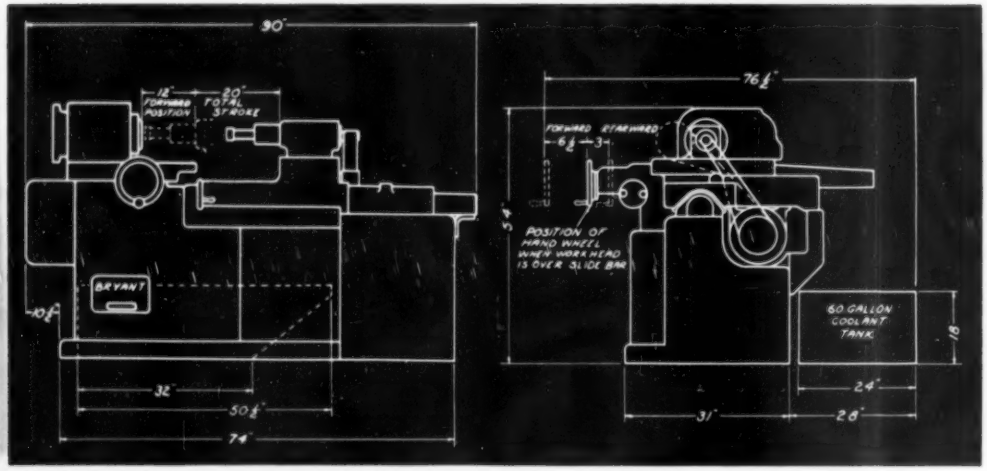
Bryant Chucking Grinder Company in Springfield. Vermont. U.S.A.

FOR HOLE GRINDING

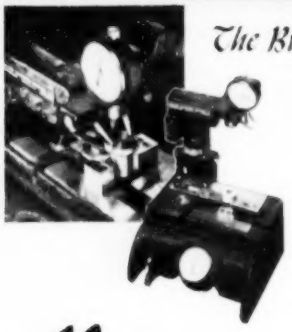


The Bryant 1116 Hydraulic Hole Grinder

This machine is for general purpose hole grinding. It has convenient centralized controls and all features necessary to handle a variety of work with minimum time and effort needed for changing jobs. For stable 3-point support, the wheel spindle is mounted on a cylindrical bar which is supported on 2 cylindrical bearings. The rear of the slide is supported on a hardened and ground guide plate. Workhead may be swiveled for grinding tapers up to 90° included angle. Provision is made for mounting a face grinding spindle in addition to the hole grinding spindle. The No. 1116 will swing 16" with 8" max. hole depth. Write for folder.



FACE SQUARE WITH INTERNAL THREAD



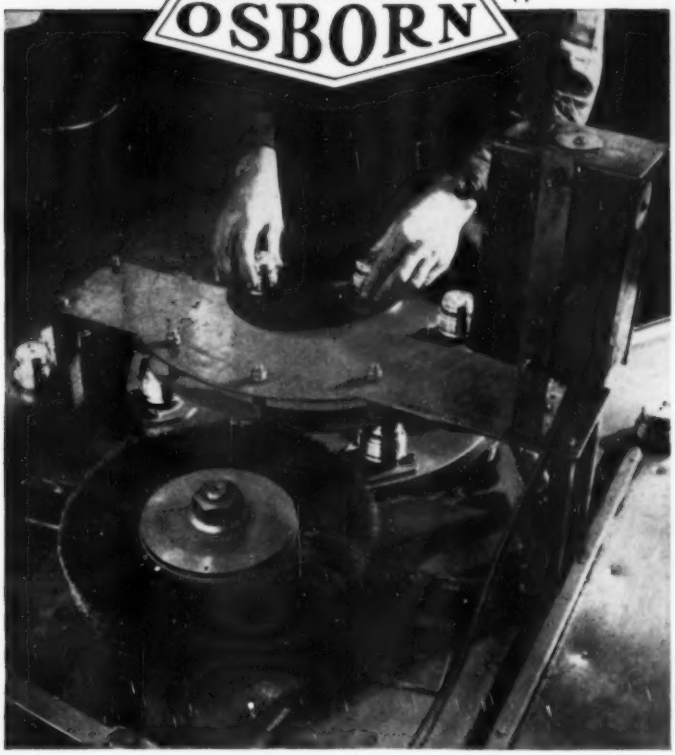
The Bryant Thread Gage with Squareness-of-Face Attachment

When a face must be checked square with an internal thread, the part should be held on the thread flank and rotated in this position. The Bryant Gage does this, regardless of variation in roundness, P.D., lead or thread form. The squareness-of-face indicator is raised by a yoke at a constant rate regardless of face run-out, thus giving a direct and exact reading of squareness with the thread axis. Simultaneous readings can be made — the Bryant Gage checks thread size — the Attachment shows face run-out.

Bryant Thread Gage gives accumulated reading of P.D., form and lead on dial indicator 4 to 5 times faster than plug gaging.

Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

OSBORN



Why 400?
Deburr 1400 per hour!

Here's how a manufacturer of brass components for ammunition has stepped up production with Osborn Power Brushing:

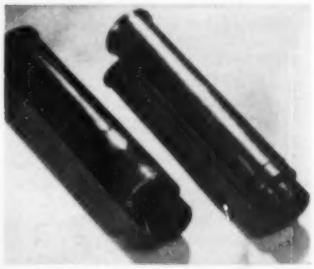
In the removal of feather burrs from threads and the machined surface of these brass parts, former output was 400 per hour. With the help of the **O**sborn **B**rushing **A**nalyst, this company designed the brushing machine shown. The parts are placed on spindles of a rotating table. As they pass the Osborn Monitor Brush, they rotate and expose the entire face uniformly to the brush. Parts come clean and smooth . . . at a rate of 1400 per hour! And in another machine, Osborn Brushes deburr the internal threads of this part . . . smooth and fast!

Have the **OBA** show you production-boosting ideas for your shop! Call today or write, *The Osborn Manufacturing Company, Dept. 784, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

"CENTERLESS BRUSHING" speeds the production of fine finishes for cylindrical parts such as this compressor piston. One user of this Osborn-developed method gets micro-smooth finishes at outputs as high as 10,000 pistons per 8 hours. Can be applied to many sizes of parts and types of material.



CLEANS SCALE. Heat treat scale on the tube at the left is removed by Osborn power brushing. Result, shown at right, is perfectly clean surface, ready for painting. Have an **OBA** study your product cleaning operations to find ways to cut their cost.

FASTER DEBURRING. Here's another "before and after" example of gear deburring with the Osborn Work Holder Brushing Lathe. Burrs and sharp edges are removed uniformly. Production increases of 20% to 1570% are being reported by users.

WHAT'S YOUR PROBLEM?
The **O**sborn **B**rushing **A**nalyst will gladly help. Call him today!

Davis Car-Wheel Boring Tool Prevents Bar Deflection

Tool used to bore hub wheels used on railroad cars eliminates boring problems caused by the cored openings which tend to deflect bar travel and unusual machine wear because of such deflection. Known as the 3-in-1, the tool uses an extra set of cutters located between the first roughing cutters and the final finishing ones. Arrangement of these intermediate cutters provides for continuous contact in the bore during the boring cycle regardless of the cored openings. Cutters actually support the boring tool in the bore, lending rigidity to both the bar and machine ram. This, in turn, prevents deflection which might cause serious ram distortion.

The tool is equipped with Davis Micrometer expansion blocks in which blades or cutters of solid tungsten carbide are used. Adjustment of cutters to required bore size is easily made. Through a graduated main screw operating an expanding wedge, cutter movement is controlled within 0.001 in. As much as 1⅛ in. diametrical adjustment is possible. Holes up to 12 in. dia can be bored.

Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.

Sheet-Metal Clamps For Riveting and Welding

These clamps are made in five basic styles for various applications. Sizes range from 3/16- to 1½-in.-thick material and fit drill holes from 0.096 to 0.350 in.

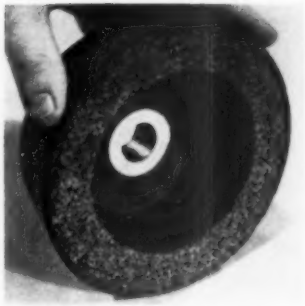
Plunger seal clamps have the spring enclosed and are recommended for use where material thickness does not exceed 3/16 in. Where greater thicknesses are encountered and more spring tension is needed, the open spring clamp is used. Where the edges of the material to be held are accessible and there are no drilled holes, the side-grip clamp is used. These three models are all applied quickly, easily, and safely using 3H safety pliers or safety gun.

The hand-operated clamp is for use with bench work and does not require an applying tool. It is especially useful on templets. The wing-nut clamp provides more tension where needed and accommodates greater thicknesses of material.

Monogram Mfg Co, 2204 Colorado St, Santa Monica, Calif.

A rubber floor mat with a built-in radiant-heating unit has been developed which operates on 110-v current available from any lamp socket or baseboard outlet. Normal operating temp for the heater is about 35 F above surrounding temp. Rubber used in the Uskon heaters is especially constructed for toughness.

US Rubber Co, Rockefeller Center, New York, N. Y.

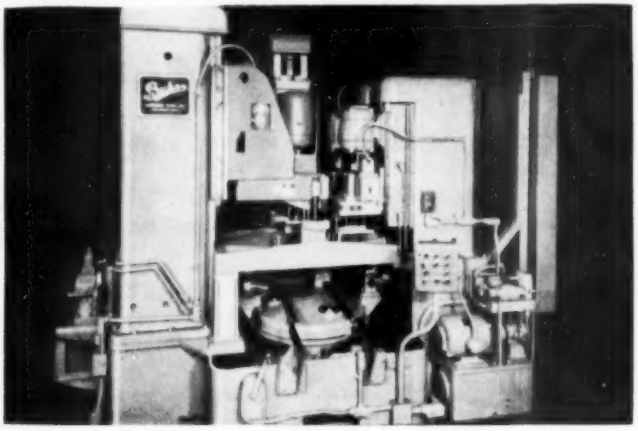


Hard Shell on Grinding Wheel Resists Rounding of Cutting Edge

This cup grinding wheel has a hard shell of resin-bonded abrasive built around a resin-abrasive core. Shell, which is 3/16 of an in. in thickness, resists mushrooming or rounding of the wheel's cutting edge; wear occurs evenly across entire face of the wheel.

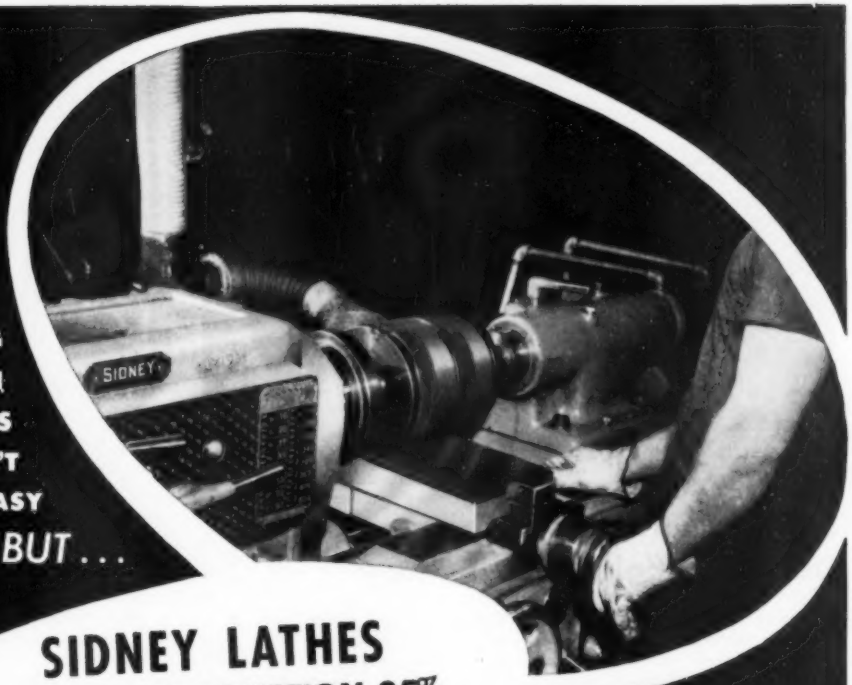
The US Royalite hard-shell cup wheel is said to be particularly useful for accurately grinding difficult corners and complicated shapes. Over-all dia is tapered from 6 in. to 4¾ in., thickness is 2 in.; it is available for three standard types of arbors.

US Rubber Co, Rockefeller Center, New York 20, N. Y.



SPECIAL DRILLING MACHINE consist of a main base, to which are mounted four vertical hydraulic drill units, a single part-holding fixture, and a 36-in.-dia 10-station index table, and a central coolant system. For tool safety, the machine has been constructed so that the No. 2 unit must complete a work cycle followed by one index, before the No. 3 unit can function. Special control equipment also insures a complete work cycle by both the No. 2 and No. 3 units before No. 4 can begin. The work is on an airplane supercharger with two complete revolutions of the index required to complete one part. — *Buhr Machine Tool Co, Ann Arbor, Mich.*

FORM TURNING PISTON RINGS ISN'T EASY *BUT . . .*



SIDNEY LATHES

INCREASED PRODUCTION 25% AND IMPROVED QUALITY FOR PERFECT CIRCLE

When you consider the millions and millions of piston rings produced by PERFECT CIRCLE you can understand what a 25% increase can mean in the total output. And think also of the infinite precision necessary to achieve the required smoothness on which so much depends.

SIDNEY LATHE'S HERRINGBONE GEARS ELIMINATE TOOTH MARKS

Here's What PERFECT CIRCLE says about SIDNEY LATHES:

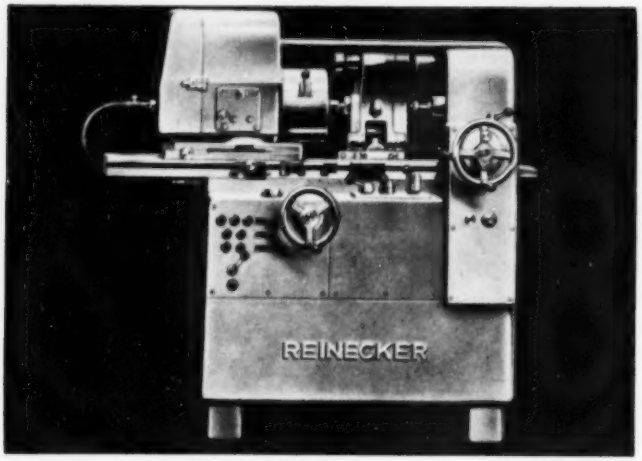
"Your Sidney Lathes were built with special attachments for irregular inner diameter boring and outer diameter contour turning and slitting. *Production of surface feet per minute increased about 25%.* At the same time the quality of the product was improved because of the ability of the Sidney equipment to hold closer tolerances. These factors resulted in increased production per man hour, improved quality and enabled PERFECT CIRCLE to meet delivery dates."

PUT YOUR PROBLEM UP TO SIDNEY . . . WE'LL HELP SOLVE IT.

Write for details or contact nearest Sidney representative

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904



Internal and Face Grinding Done in Single Work Setting

Internal and face grinding operations are performed in a single setting of the work on the Reinecker Model JSOP Machine. Combining both operations in one setup reduces rechucking and centering time, assures a ground face which is true to the bore, and increases output.

Single lever controls rapid travel, grinding movement, work-spindle rotation, and coolant flow. Chucking is done by magnetic, collet, or three-jaw chucks.

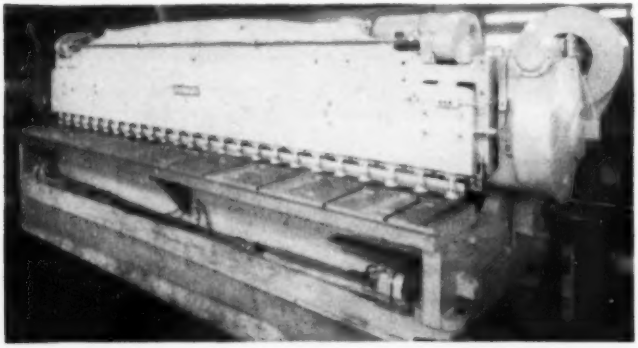
Semi-automatic wheel redressing assures uniform accuracy for large quantities of work. An angular adjustment enables the grinding of inside tapers up to 30°.

The grinder provides hydraulic, infinitely variable table movement, grinding wheel infeed, and hydraulic movement of the face-grinding bracket, which is adaptable for cup- and face-wheels.

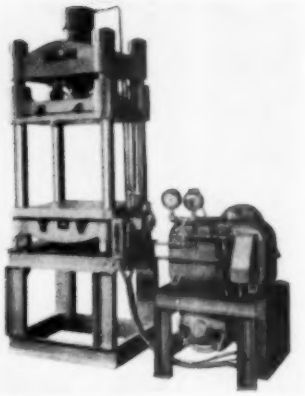
Working range: bores from 0.16 to 3 in. dia, 5-in. maximum grinding depth, and 9-in. maximum face grinding dia.

The machine is also available without face grinding equipment.

Kurt Orban Co, 205 E 42nd St, New York 17, NY.



SQUARING SHEAR is able to cut 24 ft of ¼-in. mild-steel plate. It is claimed to be the longest squaring shear produced in the US. The hydraulic holddowns exert more than 22 tons pressure. Cutting cycle is 20 strokes per minute. Other features are: 24-in. throat or gap, 4-in. back gage range, light-beam shearing gage, and an air clutch control equipped with two foot valves. — *The Cincinnati Shaper Co, Hopple, Garrard & Elam Sts, Cincinnati 25, Ohio*



Rodgers Platen Presses

Line of platen presses are available with square or rectangular multiple platens, 90°-angle transfer frame, and top transfer. Capacities range from 10 to 500 tons.

The maximum deflection does not exceed 0.0005 in. per inch of span on each of the work platens, when the full rated load is applied uniformly over the entire working area. Heavier construction can be supplied when work requires less than 0.0005 in. deflection.

A two-speed hydraulic hand pump develops a maximum pressure of 10,000 psi, with automatic shift. Or a 2-cylinder or 4-cylinder power driven pump delivers 2½ gal. or 5½ gal. of oil per minute, respectively. For faster approach and return speeds, the two power-driven pumps can be furnished with either auxiliary pumps or accumulators. Either single lever or automatic controls can be furnished.

All the presses can be supplied with either single or double-acting cylinders. The cylinders are quickly and easily removed, either for use outside the press or for servicing. Power pumps are separate from the press frame to allow instant inspection and minimize downtime when repairs are needed. One pumping unit may be used to operate several presses.

Rodgers Hydraulic, Inc, Minneapolis 16, Minn.

Drift has a pin to attach the head to the handle, a special alloy which can't chip, flake, or spark, and a special stepped-hollow construction which prevents mushrooming. It is claimed to outlast ordinary drifts up to 30 times.

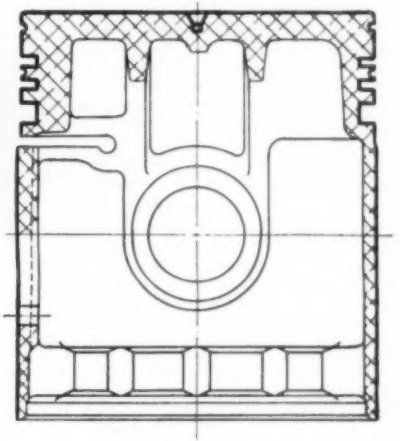
The Custanite Corp, Box 66, Larchmont, N. Y.

ASK **BAIRD** ABOUT IT!

HIGH PRODUCTION TOOLING

Here's a good example of ELLIPTICAL turning

Aluminum alloy piston 490 pieces per hour



About 3¼" diameter

The piston is held in a mechanically operated expanding pin type chuck and centered on a finished land inside the piston skirt. Piston is rough and finish turned at skirt end; elliptical O.D.; DOME and 5 groove and dome centered; grooves chamfered.

BAIRD No. 76H *automatic* CHUCKER

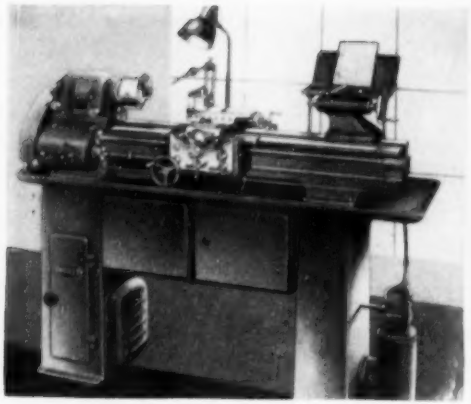
For high speed, repetitive production with maintained accuracy, this horizontal chucker is cutting costs in many leading automotive, aircraft and other plants. Both longitudinal and cross tool slides have micrometer adjustment and are independent; each of 6 spindles may vary speeds to suit operations. Automatic chucking permits operator to use both hands; automatic stop acts at end of cycle if work has not been unloaded or loaded in proper sequence.

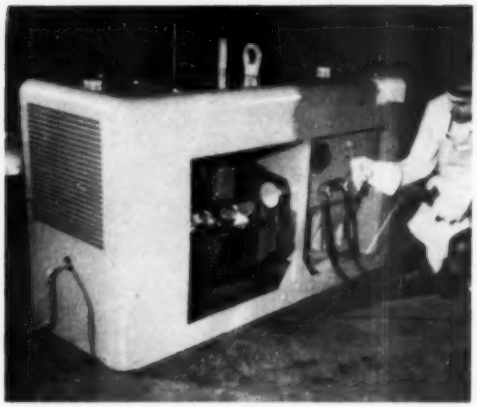
If you wish to combine in a single automatic cycle such operations as turning, facing, drilling, tapping, grooving and chamfering . . . this is your machine . . . ask Baird about it!

the BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

AUTOMATIC BORING TOOLS • AUTOMATIC WIRE & RIBBON METAL FORMING MACHINES • AUTOMATIC PRESSES • BURNISHING BARRELS

7BA52





Weiler Precision Lathes

The Weiler (German made) lathe is supported by a chip pan and based either on (1) square pedestal of welded steel construction; (2) a cast-iron double column stand of box design; (3) on a combined column and straight leg stand, having either a toolbox or a drawer for tool storage.

The main drive is obtained from a built-in motor either through a V-belt cone-pulley train or an infinitely variable-speed drive unit, depending upon the machine. The drive is either direct or by means of a retractable back gearing running in an oil bath, providing spindle speeds of 38 to 1820 rpm. The spindle is mounted on the front headstock bearing and two ajustable, taper roller bearings. In the rear headstock bearing it is mounted in an adjustable friction bearing to obtain silent running. The driving pulley and the gear wheel for the back gearing are mounted in a rigidly supported headstock, directly behind the front headstock bearing. The main drive construction and that of the headstock bearing are said to insure concentric running to less than 0.00012 in.

The feeds are transferred from the main spindle by pick-off gears or quick-change gear box to an interchangeable leadscrew or a separate feed rod respectively. The working range comprises: longitudinal feeds from 0.0008 to 0.0196 in., cross feeds from 0.0004 to 0.0100 in., metric thread pitches from 0.25 to 6.0 mm, English thread pitches from 4 to 112 tpi, module pitches from 0.5 to 2.5 mm, and from 10 to 60.

There are two models of brass finisher's lathes, and two models of engine lathes. The Model LZ 280 engine lathe is provided with a quick-change gear box and power cross feed. Because of the wide feed range with optional use of an infinitely variable speed drive unit, this machine can be used as a universal tool or production lathe. An inserted bridge brings up the swing-over bed to 13½ in.

Transmares Corp, 15 William St, New York 5, N. Y.

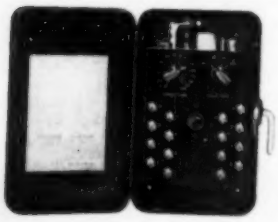
Engine-Driven Welder Also Supplies Auxiliary Power

Light-weight, engine-driven welder also supplies 110 v, 60 cycle, single-phase power from a conventional plug-in outlet.

Nominal rating of the welder is 200-amp, 40-v, 60 percent duty cycle with current range from 40 to 250 amp in accordance with NEMA standards. During off-welding periods, auxiliary power of 3 kw at 100 percent pf or 2 kwa at 80 percent pf, are available for lights and power tools. During welding periods about 300-w auxiliary power is available for lights.

Coupled to a Ford "120," 4-cycle, 4-cylinder water-cooled engine, the self-excited, compound-wound generator functions both as a dc generator and a single-phase alternator for auxiliary power. Welding current is controlled in four ranges by a tap switch and shunt-field rheostat. The ac power circuit includes conventional outlets, a voltmeter, and a breaker with overload protection.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.



Photoswitch Electronic Timer

The type 30HL1 is an automatic timer for intervals from 1/20 sec to 4 min. It provides four basic means of timing: interval, delayed action, automatic repeat, and programming, as well as many variations of these. All these timing combinations may be utilized by merely changing external connections to the terminal board.

The basic electronic circuit is self-compensating for changes in line voltage—resulting in greater accuracy. Even low line voltages do not affect the timer's operation. The unit uses only one vacuum tube and one relay.

Photoswitch Inc, 77 Broadway, Cambridge 42, Mass.

A graph has been devised to permit scaling directly from an engineering drawing into an accurate perspective view. Graphs are designed to represent an inversion of the six faces of a cube; each of the planes is a grid, graduated in perspective foreshortening, from which dimensions may be plotted and projected. Set includes seven basic graphs, each of which may be used as a top or bottom view for drawings of a size from 8x10 in. up to its full dimension of 30x60 in.

Tech-Art Graphs, 315 S 15 St, Philadelphia, Pa.

Photograph of a section of a failed tube showing excessive thinning and pitting of the outer surface. Note also the circumferential cracks.

CORROSION STUDIES CAN INCREASE THE ECONOMY OF COPPER ALLOYS

Copper and its alloys are notable for their resistance to corrosion under a wide variety of conditions. There are industrial applications where copper or the appropriate copper alloy should give an indefinitely long life, but where failure because of corrosion may result by reason of unsuitable design of equipment or improper control of environment. Further, there are many situations in which no commercial metal or alloy will have an extended life, but in which copper or one of its alloys possesses a combination of physical and chemical properties which render it the best obtainable material, when all factors, including ultimate costs, are taken into consideration. Hence correct specification becomes of great importance. Recognition of this by industry is responsible for the fact that the Revere Research Department devotes so much time to studying the corrosive effects of fluids and gases, and to preventive measures.

Recently a large manufacturer, who produces condensers as well as other equipment, reported that arsenical Admiralty tubes in a steam-jet ejector were failing after five years. This length of service is not too bad, but nevertheless such tubes often last much longer. Could we make any suggestions?

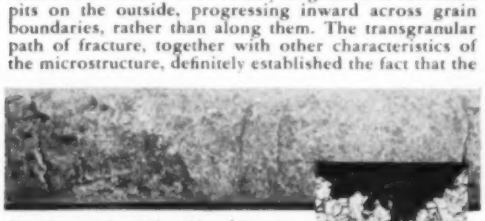
Seven failed tubes were examined for type of corrosion, metal and scale analysis. The facts were: outer surfaces were badly pitted and grooved with holes completely through in some areas; the inside surfaces were relatively untouched; cracking was circumferential, progressing from the outside; outer scale was largely cupric carbonates and copper sulfide; inner scale was calcium carbonate, cuprous oxide and some iron oxide. Microscopic examination of the cracks showed they originated in corrosion pits on the outside, progressing inward across grain boundaries, rather than along them. The transgranular path of fracture, together with other characteristics of the microstructure, definitely established the fact that the failure was of the corrosion-fatigue type. The corroding pits on the outside created stress concentration points of weakness, from which the cracks originated. Eventually the localized stress exceeded the endurance limit of the metal and it cracked.

The conclusion was, therefore, that damage was from two sources—the first being excessive carbon dioxide and the other non-condensable gases in the steam, which caused the excessive pitting and thinning. It is not unusual to have these and other corrodants present in damaging amounts in the air-ejector system, whereas they are not injurious elsewhere. The second cause of failure was excessive vibration somewhere in the unit which was responsible for the corrosion fatigue failure.

RECOMMENDATIONS. The copper-base tube alloy that generally possesses the greatest resistance to the non-condensable gases responsible for the corrosion of the Admiralty tubes is 5% aluminum bronze. Re-tubing with this was suggested. It was also recommended that steps be taken to effect a material reduction in tube vibration by placing a baffle in the steam inlet. In addition, it was pointed out that many operators find it good practice to discharge the after-condenser drain to the sewer instead of returning it to the system. By this means, the amount of carbon dioxide, ammonia and other gases in the system can be substantially decreased.

* * *

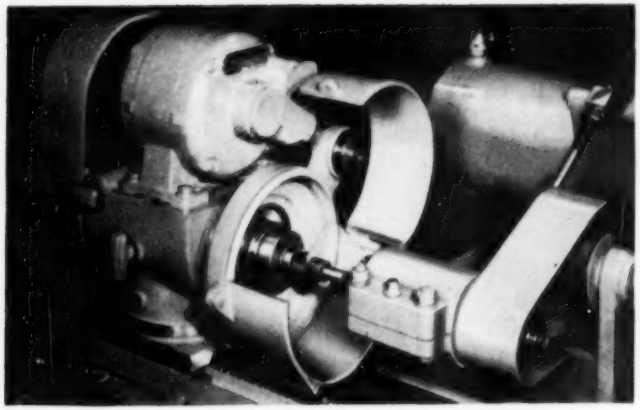
It is interesting to note that the Revere Research Department, located in Rome, N. Y., was able to determine these causes and suggest remedies without ever having seen the condenser. This is the result of modern equipment, and long experience in studying the problems of corrosion. If you have a problem regarding the corrosion of copper and copper alloys, or aluminum alloys, why not take it up with the nearest Revere office? Remember, corrosion that is too rapid wastes both your money and our national resources.



Here the circumferential cracking of the outer surface can be seen.

Photomicrograph of a section through a tube showing transgranular corrosion-fatigue crack originating from the base of a pit on the outer surface of the tube. Magnification 225X. All photographs taken by the Research Department of Revere.

REVERE
COPPER AND BRASS INCORPORATED
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.
* *
Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere
SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY



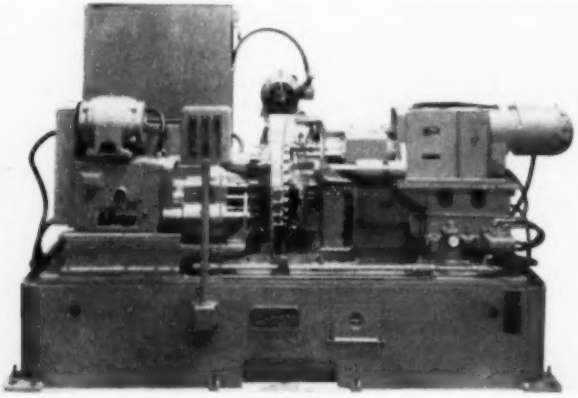
Interchangeable Wheel Heads On Rivett Internal-External Grinder

The Model 84 grinds holes from very small up to 3-in. dia, with a maximum 4-in. depth depending upon the dia. It grinds externally up to 3 in. dia with a length of 4 in.

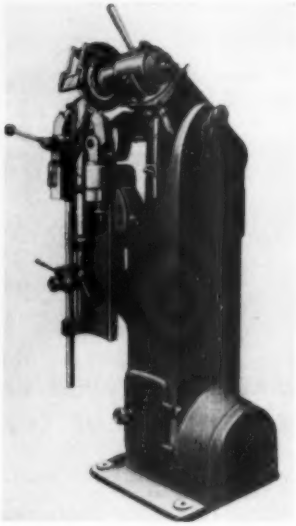
Interchangeable motor - driven wheelheads for external and internal spindles can be selected for the job—with removable arbor, with chuck for mounted wheels, or with solid shaft. Speeds range from 12,000 to 35,000 rpm. Workhead or table can be swiveled for taper grinding, and a micrometer table stop positions work for shoulder grinding, using fine hand table travel.

Other features include: lathe-type spindle in workhead mounts draw-in collets or step chucks directly; lever operation of collets and step chucks; mechanical power table travel with infinite speed and stroke adjustment within ¼ to 4 in. stroke; hand table travel with both coarse and fine feeds to 0.001 in.; and in-feed with coarse adjustment to 0.001 in. and fine to 0.0001 in.

Rivett Lathe & Grinder, Inc, Boston Mass.



TWELVE-POSITION AUTOMATIC INDEXING MACHINE completes the following operations on 8 to 12 tank clutches per hour: drills 24 holes to 13/32 dia, removes burrs on both sides of the drilled holes, counterbores 24 holes and mills 12 notches to depth, end mills two notches through, and end mills three additional individual notches. The machine consists of five Avey automatic No. 2 Cam Feed Units, mounted on a fabricated steel base around the 12-position trunnion table. All of the units were arranged with special drill and milling heads. — *Avey Drilling Machine Co, Inc, Cincinnati 1, Ohio*



Drill Pointing, Web Thinning Combined on German Grinder

Two front angles of a twist-drill point are ground symmetrically and the thickness of the flutes reduced at the same time by the oscillating grinding wheel used on the May Model A4.

Drills from 0.393 to 2.95 in. in dia can be clamped between the spring-loaded jaws. The grinding wheel is moved manually to the point of the drill. Clamping and sharpening motions are mechanically locked, so that accuracy is independent of operator skill.

An indicator allows selection of three types of grinding:

1. For a simple reduction in flute thickness, one side of the point is ground to the depth fixed by the setting of a stop. The drill is then turned 180° and the other side ground.

2. For improved chip flow, when the lowest point on the wheel is reached, the drill is moved sideways at the same time that it is turned round its center. These movements are controlled by handwheel.

3. For drilling in very hard steel, the grinding is carried up to the center of the drill. This provides a top rake for easier metal penetration.

Base measures 15x14 in. and floor area of 40x24 in. is required for operation. Height is 56 in. The grinding spindle is driven by a ¼-hp motor, by means of a belt running over tension rollers.

Kurt Orban Co, 205 E 42nd St, New York 17, N. Y.

Hjalmar Ellstrom

INVENTOR OF THE GAGE BLOCK

The achievement of perfection . . . the mastery of any art, craft, or science . . . is a rare human accomplishment. A discovery or an invention that contributes to the total welfare of all mankind is rarely the heritage left by a single man. So rare is it, indeed, that in such infrequent instances, the true facts surrounding its origin are often distorted, or even lost in the conflicting claims of others who would seek the worldly gains to be derived from undeserved fame.

So it was with the Gage Block. For, actually, this basic standard of measurement used the world around was originally conceived and invented solely and entirely by . . . Hjalmar Ellstrom. Here, briefly, is the story of his accomplishment:

During the early 1890's, Hjalmar Ellstrom was employed by the government rifle factory at Eskilstuna, Sweden. He was a master craftsman . . . a man of infinite patience who took great pride in his work. He was a man of vision, too, who recognized the limitations imposed upon industry by the lack of sufficiently accurate measuring devices. So, with a then unheard of standard of precision as his ultimate goal, he alone developed and perfected his checking instruments and techniques . . . then alone he created the world's first gage block accurate to the infinitesimal millionth part of an inch.

Today, though his achievement has been copied and imitated by others, his personal unqualified devotion to accuracy is the exclusive heritage of Ellstrom . . . *now measuring in millionths for three generations.*

ELLSTROM STANDARDS DIVISION

DEARBORN GAGE CO. • 22035 BEECH ST. • DEARBORN, MICH.

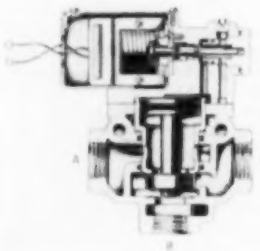
Originators of Chromium Plated Gage Blocks

Whirling Solvent Cleans Parts

Dirt, oil, grease, and chips are removed from parts placed in the Wirl Agitor cleaning units; whirling solvent automatically cleans parts placed in a basket or rack within the tank. Basket can be hooked onto the side of the tank to permit drainage.

Eight models are available, ranging from portable units with casters to stationary types capable of handling several sizes of engine blocks; capacity range is 5 to 330 gallons.

Graymills Corp, 3705 Lincoln Ave, Chicago 13, Ill.



Solenoid Air Control Valve Fails Safe Under All Conditions

This three-way solenoid pilot-master valve for especially hazardous applications is so designed that it fails safe under all conditions. Its principal use is expected to be for the control of clutch and brake cylinders on mechanical presses, where the failure of a valve to reverse when the solenoid is de-energized might result in serious injury to the operator.

Called the Series B-3, the main or master valve portion is pressure operated in both directions and therefore springless. By applying the same principle of exposing differential areas to pressure to the design of the pilot head mechanism, there is a completely springless valve assembly in which both pilot and master valves are automatically returned to the inoperative position by air pressure the instant the solenoid is de-energized. Since retained air in the brake and clutch cylinders of the press would have sufficient pressure to operate the valve even in case of a break or a serious leak in air line, there is no situation in which the press would not be stopped, not even if there was simultaneous loss of both voltage and air supply.

The possibility that the valve itself might jam, due to spreading laminations in the plunger of the solenoid, is prevented by the silicone iron plunger having an anvil of hardened tool steel welded across the entire face, so that laminations cannot spread.

The main or master valve can be operated either two-way or three-way, normally closed to pressure or normally open. Recommended pressure range is from 40 to 125 psi. A replaceable cartridge contains every moving part of the main or master valve. The solenoid can be completely disassembled, and coils for 115, 230, or 460 volts and for either 25 or 50/60 cycles are available as standard. One size of pilot head fits all five sizes of master valve from ⅜ through 1¼ in. ips.

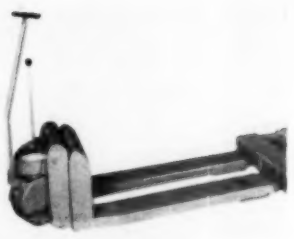
Hannifin Corp, 1118 S Kilbourn Ave, Chicago 24, Ill.

Small Magnetic Chucks

Three small magnetic chucks are now available for small machine tools and bench work.

Sizes are 5x10, 6x12, and 6x18 in., construction is all-steel, and they operate on ac voltage. The magnetic area is large enough so that work can be held on the extreme edges. They are moisture and shockproof. Complete standard accessories are available.

Hanchett Magna-Lock Corp., Dept 100, Big Rapids, Mich.

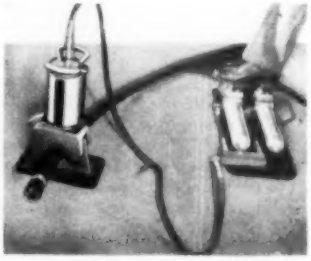


Leverlift Floor Trucks Handle Double-Faced Pallets

Leverlift features toggle boosters and helper rolls that enable it to slip into double-faced pallets without jockeying. Toggle boosters on the ends of the platform tines engage the bottom face of the pallet first, lifting the platform slightly so that the rear wheels can roll smoothly into the pallet. Rear wheels of the truck are then projected through the bottom of the pallet and the load is lifted by action of the hydraulic pump. As the platform is raised, it is moved toward the operator, facilitating use against walls. Capacity is 4000 lb, and it is available in five standard fork lengths.

Safety features include: hand release valve for accurate control of lowering speed; overload safety valve on hydraulic system; torque equalizer on lifting linkage; pull handle held vertical when not in use by spring.

Service Caster and Truck Corp, Albion, Mich.



Guillotine Wire Rope Cutter

Series-15 guillotine is a latch-type design wire rope cutter with cutting time as low as 7 seconds. Unit exerts up to 50 tons thrust, cutting up to 1-¾-in. wire rope. The tool is available with a variety of electric and air-hydraulic pump assemblies, including foot lever and remote control operations; weight of unit is 75 lbs.

Manco Mfg Co, Bradley, Ill.

ASSEMBLE AND INSPECT UNDER MAGNIFICATION *in one operation...*

with the Kodak Contour Projector

This starter switch for a refrigerator motor presents a tough assembly and inspection problem. The springs must be accurately bent and adjusted by hand—tolerances are close.

With the Kodak Contour Projector the whole operation—bending and checking—may be done at the same time and under the magnification that's most convenient.

Since the Kodak Contour Projector has provisions for surface illumination from the same lens that picks up the image, every detail of the switch is shown on the screen. A 45° mirror permits the part to be mounted flat for easy accessibility. Both to adjust the part and check tolerances, the operator simply compares the magnified image with a chart-gage laid on the bright screen.

Whether your interest is in large parts or small parts, simple parts or complex parts with many dimensions, a Kodak Contour Projector will do the job quickly, completely, and accurately. The operator can work in a lighted room unhampered by hoods or curtains. And little training is required to get the work out in a hurry.

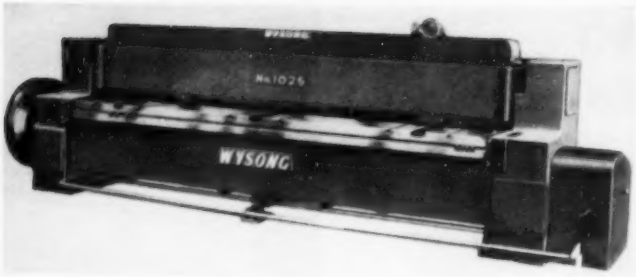
For rapid, routine inspection and adjustment work, the economical, stripped-down Kodak Contour Projector, Model 3, will meet your requirements. For toolroom measurement, the versatile Model 2A is what you need. In your area there is an experienced field engineer who will be glad to discuss your own particular problems. You can get in touch with him by writing Eastman Kodak Company, Industrial Optical Sales Division, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Optical Gaging

A new sound movie shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak



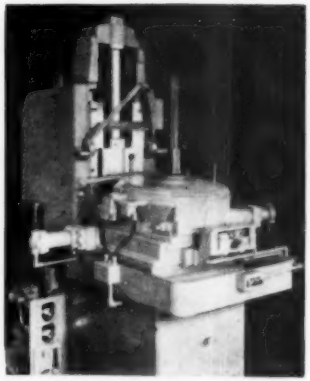
Holddown on Squaring Shears Compensates for Work Thicknesses

Features of this ¼-in. power squaring shear line include: ball-bearing back gage adjustable to 0.0078 in., front-operated hand-wheel, holddown action by roller and cam action, individual compression springs in each holddown foot to compensate for varying thickness, and work, and jaw clutch.

An open space between holddown and knife bar makes the cutting line clearly visible to operator.

The knife bar is a massive, well-ribbed, one-piece casting. Bed is one-piece casting with cored pockets for added strength. To give accurate measure from cutting line, adjustable stainless-steel scales are embedded in various positions on the surface of the table.

Wysong and Miles Co, Greensboro, NC.



FIFTEEN-TON, 66-IN. STROKE PULL-DOWN BROACHING MACHINE, equipped with a special table and an adjustable shuttle travel, produces large tapered splines in tractor sprocket wheels of varying OD's. The wheel is placed over the broach tower on a fixture plate with a broach in the down position. The angle of the plate is made so that the broach will produce splines with the correct amount of taper. The parts are held in position with holddown studs and a strap clamp. Automatic cycle is as follows: The broach travels up, the table shuttles into position for broaching, the broach travels down, the table recedes, the fixture indexes to position for the next spline, and the cycle repeats. When all splines have been produced, the machine stops for unloading. Operation is hydraulic with electrical controls. A hinged arm is used to back up the broach guard during the cut and thus avoid broach deflection — *Colonial Broach Co, P O Box 37 Harper Station, Detroit 13, Mich.*

Clausing 18-In. Drillpress Has Vernier Depth Stop

Capacity in steel	¾ in.
Spindle taper	No. 3 Morse
Maximum distance spindle to table	39 in.
Drills to center of 18¼ in. circle	
Maximum distance, spindle to base	50 in.

Features of this heavy-duty drillpress include: drive spindle supported by two sealed ball bearings, one above and one below the pulley; spindle floated free from quill by a sealed ball bearing at top and a double-row bearing at bottom; vernier depth stop with control accurate to 0.001 in.; 6½ in. spindle travel; positioning mechanism to move both head and table; hinged motor support, and ground base.

Clausing Div, Atlas Press Co, 2304 N Pitcher St, Kalamazoo, Mich.

Promatic Electronic Timer controls timed operations between 60 milliseconds and 60 seconds. Timing commences upon closure of any external switch; operation is from 115 v ac or 220 v ac, 60-cycle. Timers may be mounted back-of-panel, against a wall or in the rear of a cabinet. Typical applications include: automatic process control, on machine tools and molding machines.

General Control Co, Boston 34, Mass.

Super-Grip toggle bolts may be installed with the head outside the wall, or with the nut outside the wall; toggles may be purchased separately for use with any bolt. Toggle head is available for bolt dias from ⅛ in. up to ½ in.

Super-Grip Anchor Bolt Co, 3333 N 22nd St, Philadelphia 40, Pa.

Collapsible Stock Rack

This collapsible stock rack, with no detached or loose parts, is designed so that a solid floor can be laid for the handling of bulk goods. Nesting caps on the feet make it possible to stack loaded racks in production, storage, and shipping.

With end frames raised, telescoping tubular inserts provide positive locking; simple lift control permits quick folding.

Equipment Mfg, Inc, Detroit, Mich.

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol E.P. Roller Grease

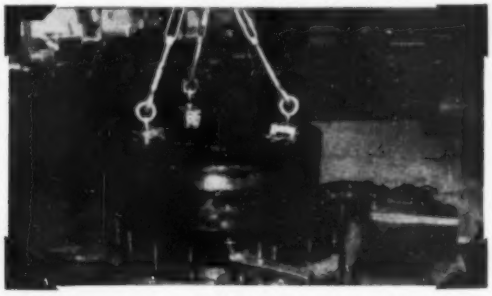
UNIT 16" × 44" roll neck bearing

CONDITIONS Temp. to 140°F — extreme pressures

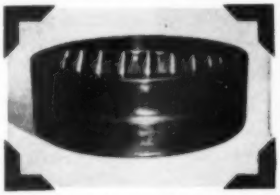
PERIOD 875 hours

FIRM Kaiser Aluminum & Chemical Corp., Spokane, Wash.

Grease retains "body" after 875 hours in rolling mill bearing



CALOL EP ROLLER GREASE-1X, in this big roll neck bearing and chuck, was sealed around the bearing during 875 hours of service in a "hot" rolling mill. No grease leaked from the chuck during operation in temperatures up to 140°F. The grease retains high lubricating qualities—is being changed only because it is practice to remove and service the bearings at intervals of approximately 1000 hours.



THE 2800-POUND BEARING shows no wear on either the rollers or race. There was no sign of corrosion in the chuck and neoprene seals were perfect. After cleaning the unit was re-assembled, refilled with 125 pounds of CALOL EP Roller Grease-1X, and put back in service.

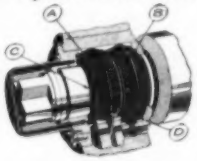
REMARKS: The Kaiser Rolling Mill at Spokane, Washington, produces sheet and coil aluminum. Roll neck bearings in the mill have been lubricated with CALOL EP Roller Grease since 1946. Made from highly specialized stocks, this grease will solve many of your anti-friction and plain bearing lubrication difficulties where extreme pressures, high temperatures or water conditions present problems too great for conventional greases.

To provide efficient operation in varied applications and sizes of anti-friction and plain bearings, CALOL EP Roller Grease is made in several grades. The heavier grades have an extra component to increase their adhesiveness.

CALOL

TRADEMARK "CALOL" REG. U.S. PAT. OFF.

How CALOL EP Roller Grease protects heavy-duty anti-friction bearing



A. Contains extreme pressure additives—lubricating film will not squeeze off under heaviest loads.

B. Highly water-resistant—sticks on bearings even where excessive water used for cooling.

C. Feeds slowly and evenly—creeps into small clearances and assures good lubrication. Pumps easily at low temperatures.

D. Will not corrode metal or harm neoprene and plastic seals.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any of the companies listed below.

STANDARD OIL COMPANY OF CALIFORNIA
225 Bush Street • San Francisco 20, California

THE CALIFORNIA COMPANY
P.O. Box 780 • Denver 1, Colorado

STANDARD OIL COMPANY OF TEXAS
P.O. Box 862 • El Paso, Texas

Pangborn Airless Rotoblast Barrel Reduces Abrasive Loss

The Type GN barrel has several features aimed at improving cleaning while reducing abrasive losses. Work conveyor is driven by a hardened steel chain and uses special cast ductile iron slats which will not pinch the work. The conveyor slats turn on the pitch line of the sprockets and the distance between slats is always the same at any point in travel. This prevents passage of wire or chill nails into the track of the chain where operations could be affected.

Drive is by means of V-belts to a spur-gear reducer mounted directly on the work conveyor shaft. When the barrel is operating, the conveyor travels upward to tumble the castings. After the cleaning operation, direction of the conveyor is reversed and the load is discharged into the work loader. Conveyor takeup is located on the bottom shaft where weight of the conveyor makes it easier to adjust. An automatic throwout torque arm disengages barrel drive in case of jams. It works in both loading and unloading directions.

An abrasive-tight door and housing have been developed to retain abrasive within the machine and permit economical use of new types of abrasives. The door is woven wire mesh backed with vulcanized rubber and slides on rollers in a mechanized labyrinth. It rolls up compactly out of the way as it is opened permitting easy access to the cleaning chamber. A crank actuates the door and it can be held at any position by a positive brake. It is expected that the rubber facing on the door will mean a considerable decrease in wear and maintenance.

During barrel operation, the cleaning and reclaiming system is constantly at work removing all sand and debris and maintaining the full efficiency of the abrasive. A rotary wheel scalps off large fragments, leaving the abrasive which drops through a screen. Abrasive is conveyed up to the top of the machine to a separator. At this point sand and spent abrasive are drawn out of the machine and good abrasive drops down to a storage container to be re-used. Volume of abrasive flow is controlled by an orifice plate.

A quick-acting work loader, with double cables for safety, positively delivers the entire load into the machine. Control panel has been conveniently located alongside the cleaning chamber opening and push buttons are used.

Drive motor for the unit is 1½ hp. The 6-cu-ft unit is 6 ft 8 in. deep by 6 ft wide and 13 ft 9⅞ in. high. The 12-cu-ft unit is 7 ft 9 in. deep by 9 ft 7 in. wide and 14 ft 6 in. high.

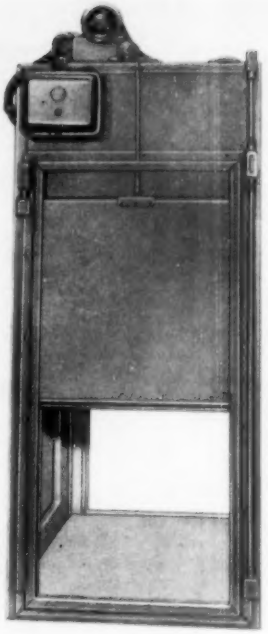
Pangborn Corp, Pangborn Blvd, Hagerstown, Md.

Manually Operated Hydraulic Lift

The Century 1000 weighs only 150 lb and will raise a 1000-lb load from floor level to a height of 4 ft or lower. A small lever at the operator's finger tip releases the platform for controlled descent. It is elevated by a two-cylinder, double-acting reciprocating pump, which contains only three moving parts. A plastic pump handle resists attack by oil and greases.

The lift has two fixed-position front and two swiveling back wheels. Over-all height is 64 in., base area is 29x34 in. It is moved manually by push-bar.

Dept KP, Century Products Co, 5925 Highway 7, Minneapolis 16, Minn.



X-ray Inspection Cabinet

Industrial cabinet is fabricated for either radiographic or fluoroscopic inspection of parts. It is designed for straight-line or rotary operation.

Trays for holding film and parts are moved into the cabinet from either end, facilitating X-ray exposures. After each exposure, doors are raised and parts trays moved into position for the next exposure.

The cabinet is lead-lined metal construction with pneumatically operated lead-lined sliding doors.

Bar-Ray Products, Inc, 209 25th St, Brooklyn, N. Y.

Model 200-E guillotine is a thumb-button unit for cutting steel rod up to ½-in. in a ¼-second cutting cycle. Unit exerts up to 20 tons thrust from portable hydraulic pump; it is adaptable to riveting, punching, and swedging operations, and is also available with hot-cutting extension equipment.

Manco Mfg Co, Bradley, Ill.

Strohm automatic screw machines, described in *AM, April 14, '52 p. 204* are now being imported by *Alfred Hofmann & Co., West New York, N. J.* instead of Kurt Orban Co. The automatic handles thread lengths up to 1.378 in. and bore depths to 1.575 in.

Get the most out of your

LELAND-GIFFORD

DRILLING MACHINES

Always Clamp the Table after Raising or Lowering

When properly positioned and clamped, the work table of any Leland-Gifford floor type machine is designed to remain at right angles to the spindle within very close limits. To insure maximum accuracy, always follow this procedure.

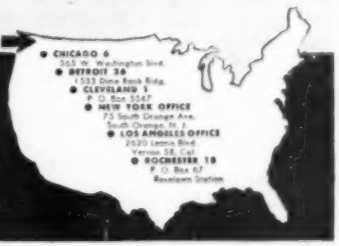
RAISING After raising to the correct height, clamp the table, then back off the raising screw a slight amount.

LOWERING Lower beyond the required height, raise to the desired level, clamp, then back off raising screw.

Be sure the ways are cleaned and lubricated before adjusting table height.

A small point? Yes... but important! Leland-Gifford Drilling Machines are built as trouble-free as master craftsmanship and long experience can make them ... with totally enclosed motors, spline lubrication wipers, oil mist lubricated spindle bearings and many other features to insure lasting precision and safe, dependable operation. But neglect or abuse can impair the performance of even the finest equipment. With reasonable care and maintenance, your Leland-Gifford Drilling Machines will keep on producing accurate holes year after year. Remember, you are making a valuable contribution to the defense effort when you take the best possible care of your production equipment.

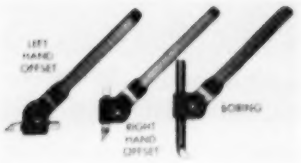
***SAVE TIME* — CONTACT THE OFFICE NEAREST YOU**



LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



Walton-American Toolholder

The Walton-American holds any size square or round tool bit or boring bar, within its range of capacity. Not only is the bit securely gripped top and bottom, but is so held that no lateral motion is possible.

The capacities of the four sizes made range from ⅛ in the smallest to 7/16 in. in the largest. The small size, No. 3, is the only holder particularly adaptable for use on a bench lathe.

The method of holding allows the use of straight and right- or left-hand offset positions, as illustrated. Because they are self-contained, no extra heads or setscrews are required, therefore, no time is lost looking for spare parts or assembling. They are individually boxed, complete with a Billings 15° single-head box wrench.

The tool bit is held parallel to the shank instead of at an angle, requiring, therefore, less grinding for clearance. This feature also gives a larger body of metal to absorb heat.

The Walton Co, Box 5, Elmwood Branch, Hartford 10, Conn.

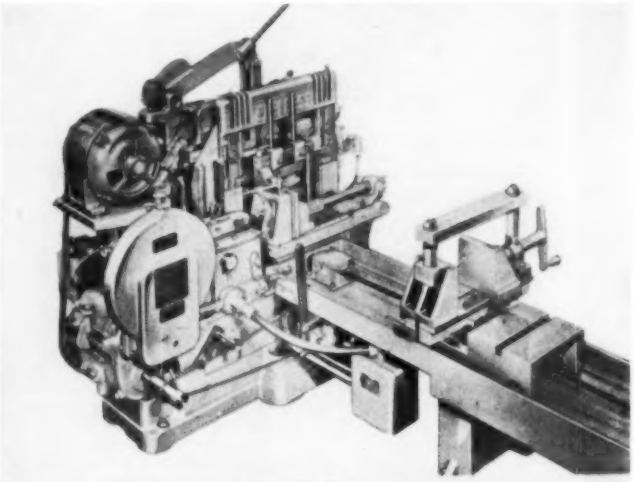
Multi-Purpose Magnetic Probe

The G-S magnetic probe is no larger than a fountain pen. The point of magnet is extended or retracted from a case by turning the end knob, with magnet strength controlled by amount of extension. A pocket clip is provided for easy carrying.

The probe is particularly useful for removing ferrous particles from hard-to-reach places—such as the operating areas of electrical instruments. Another use is to test a surface coat for the magnetic properties of the base material.

General Scientific Equipment Co, 2700 W Huntington St, Philadelphia 32, Pa.

FIVE-TON HORIZONTAL PRESS is designed specifically for piercing the flash hole on brass or steel 20-mm cartridge cases. The press operates at 60 strokes per minute with one hole pierced per stroke. The hand-filled chute feed has three stations. The first is a detector to check the position of the case in the chute, the second a work station, and the third a detector to check the correct piercing. The 1 and 3 stations have solenoid switches to stop the press if the case is loaded improperly or if hole isn't pierced. — *E W Bliss Co, Canton, Ohio*



PERMANENTLY ADJUSTED MAGNETIC CLUTCH is employed in the automatic bar-feed conveyor available for use with Mechani-Cut hacksawing machines. With this equipment, the cycle becomes 100% automatic following loading of the conveyor to completion of the last cut on the stock. The clutch has only three major parts. These are the constantly rotating center clutch plate (driven by chain from the lower transmission shaft) and two armatures, with which it is alternately engaged. One armature controls movement of the stock feed conveyor—the other operates the vise which clamps the work during the cut. When either magnet coil is energized, the armature disk and the rotor plate are instantly attracted, and then drive through friction in full magnetic couple. Unit is available for Mechani-Cut machines in 7x7- and 11x11-in. capacities. — *Peerless Machine Co, 1602 Junction Ave, Racine, Wis.*

MUELLER BRASS CO.

"600" SERIES

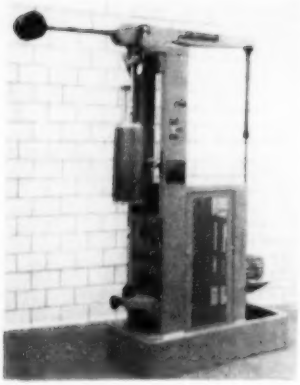
a better bearing bronze containing no-hard-to-get tin

If you use gears, connecting rods or other parts requiring bearing properties, it will pay you to investigate "600" Series, a high strength bronze that *contains no tin*. "600" Series outperforms phosphor bronzes and other bearing metals . . . it will also save time, money, and material. "600" Series bearing metals can be forged into relatively complicated shapes and produce a forging of close-grained homogeneous structure impossible to get in a sand casting. The forged shape is closer to finished size than a casting, often requires less machining, and eliminates the need of a bushing. "600" Series is available in standard and special extruded shapes in 12' mill lengths. These alloys have a low coefficient of friction, a tensile strength 2½ times greater than cast phosphor bronzes and high resistance to corrosion. There is a "600" Series alloy with the properties to fit your bearing metal need...write today for further facts.

Typical forged parts and ROD shapes produced from Mueller Brass Co. "600" Series bearing bronze

MUELLER BRASS CO.

PORT HURON 18, MICHIGAN



Lever-Arm Creep Tester Checks Jet-Engine Alloys

One of the features of this machine is the power-operated lifting mechanism for the weights needed to load specimens. During testing, the lifting platform automatically positions itself about ½ in. below the weight pan so that the knock of dropping weights is minimized when the specimen breaks in stress-rupture tests.

The base is designed so that machine need not be bolted to the floor. Contributing further to stability are leveling screws and a new type of shock absorber and vibration isolator.

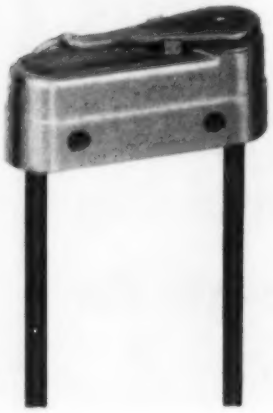
For testing at temperatures up to 1800 F an extra-large furnace with three heating zones is provided. This hastens attainment of uniform temperatures over the gage length of specimens. Temperatures in the three zones can be individually regulated from the control panel. To simplify vertical adjustment, the furnace is counter-balanced and a position-indicating scale is provided. A locking arrangement prevents shifting of the furnace during tests.

Furnace windings may be removed in a matter of minutes for inspection or repair. They are attached to an Alundum tube within a larger tube with an air space between.

Temperature control equipment is mounted on a stainless-steel panel and can be removed as a unit. The wiring systems is accessible from either front or rear. When used in conjunction with one type of standard controller, specimen temperature has been held within 1 F at 1200 F for long periods.

Elongation of specimens may be observed on a dial gage that is mounted on the upper extension grip. An elongation indicating system based on the linear differential transformer is being developed. By use of this system, the elongation of a number of specimens in different machines can be recorded automatically by a central recorder some distance away.

Arcweld Mfg Co, 150 46th St, Pittsburgh 1, Pa.



Waterproof Snap-Action Switch

Operating force	16 oz ± 6oz
Release Force	4 oz min
Pretravel	0.065 in., max
Differential Travel	0.020 in., max
Overtravel	0.010 in., min
Contact Break Distance	0.036 in., min

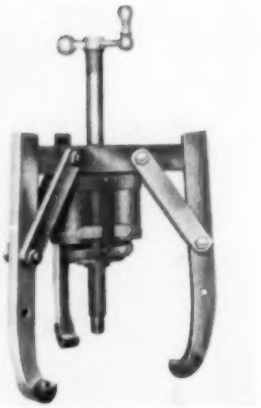
This 4HS micro switch has potted, waterproof terminal leads, and a hermetically-sealed contact chamber.

The waterproof leads, which are connected to the terminals, are potted in a high-dieletric plastic which completely seals the terminals and leads. The switches are available with leads of any required length, and they can be supplied with waterproof couplings.

The metal case is sealed at the top by a metal diaphragm, through which the external actuating lever operates. The contact chamber is filled with an inert gas under pressure and sealed. All parts of the switch are sturdily constructed to resist damage.

The electrical rating of the switch is as follows: 10-amp inductive load, or 25-amp resistive load, 28 v dc; 1 amp inductive or resistive load, 125 v ac. The switch can be had with single-pole, single-throw, or double-throw contacts. Operating force is 16 oz, ± 6 oz. Release force is 4 oz min.

Micro Switch, Freeport, Ill.

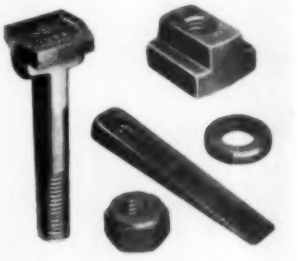


Three-Way Hydraulic Puller

Three-arm puller, adapted to hydraulic power, can now do a difficult pulling job 75% faster and easier than with a screw-powered unit. Maintenance men who already have a Power-Twin ram and an OTC 3-arm Grip-O-Matic puller need only purchase a special three-way head to convert to hydraulic operation.

Three new heads are available for corresponding sizes of pullers. The 1013-2H and 1013½-2H heads adapt the 1013 and 1013½ pullers for use with the 17½ ton Power-Twin ram and the 1014-2H and the 1015-2H adapt the 1014 and 1015 pullers for use with the 30-ton Power-Twin ram.

Owatonna Tool Co, 385 Cedar St, Owatonna, Minn.



Williams Set-Up Accessories

J H Williams & Co has added T-bolts, nuts and flat washers, T-slot nuts and set-up wedges to their line of set-up accessories. They can be used on planers, shapers, milling machines, and other similar applications.

The T-slot bolts are available in ⅜-, ½-, ⅝-, ¾-, ⅞-, and 1-in. T-slot sizes and a wide range of lengths.

J H Williams & Co, 400 Vulcan St, Buffalo 7, N.Y.

Straighten Bores, Remove Burrs, Speed Production... in a Single Honing Operation

SUNNEN®
HONING MACHINES
"Accuracy at Low Cost"

Heat Treat Distortion, burrs and scale, and out-of-roundness can all be quickly corrected with Sunnen Honing. This worm gear is typical.

Problem: Straighten and clean up, and bring to final size this heat treated worm gear, in shortest possible time.

MATERIAL: 1118 Steel
HOLE DIAMETER: .625"
TOLERANCE: .0005"
KEYWAY: 3/16" wide, full length of bore
HARDNESS: Rockwell 54-58 "C"
LENGTH: 1 7/8"
STOCK REMOVAL: .0001"-.0005"

Solution: Sunnen Model MBB-1290 Honing Machine, with Keyway type Honing Unit. Machine was installed and in operation in a little over a month after the original inquiry.

Results: The smooth finish and accurate diameters produced by Sunnen Honing make perfect fits between the gears and shafts — assures quieter operation, longer life. Production rate, including gaging time, is 400 per hour.

Sunnen Honing is showing similar results on hundreds of different parts in leading plants across the country. It is accurate, easy to use, fast — often does the job when nothing else will. On short runs you can frequently complete the job in less time than it would take to set up for other methods. Average installation costs less than $1,000.

HERE'S WHAT THESE VERSATILE MACHINES CAN DO FOR YOU

- Generate geometrically round and straight holes.
- Eliminate grinding in many cases — remove up to .006" and more from hardened steel.
- Produce bearing finishes to 2 RMS in hardened steel.
- Correct out-of-roundness and warpage.
- Eliminate bellmouth and taper in holes.
- Remove burrs and flash from holes.
- Correct heat treat and assembly distortion.
- Hold accuracy to .0001" and better.
- Salvage expensive rejects from other operations.
- Eliminate jigs and fixtures — most jobs can be set up in less than a minute.
- Produce accurate blind holes.
- Size and finish holes with ports, lands, keyways.
- Hone metals, glass, plastics, ceramics.
- Hone diameters from 1/8" to 2 3/8".

Mail the coupon for NEW FREE BOOKLET...

shows you many different ways Sunnen Honing is helping others — suggests ways it might be helpful in *your* plant.

691

SUNNEN PRODUCTS COMPANY
7926 Manchester Ave., St. Louis 17, Mo.

☐ Send me FREE Booklet of Case Histories on Sunnen Honing.
☐ Have a Sunnen Honing Engineer call.

Name .....
Company .....
Address .....
City ..... Zone ..... State .....

Let SUNNEN HONING Solve Your Hole Problems

SUNNEN PRODUCTS CO. 7926 Manchester Ave., St. Louis 17, Mo.
Canadian Plant: Chatham, Ontario

by
GARRISON
COMPLETE
GEAR CHUCK
SERVICE

Garrison Gear Chuck Service starts with your gear print and follows through with a complete service for the life of the chuck. Over thirty years of experience in designing and manufacturing pitch line control gear chucks exclusively, has built up a wealth of engineering knowledge. This knowledge is applied to designing the best custom-built gear chucks for solving your gear problems.

For detailed information as to equipment and price, mail us your gear prints marked to show the operation to be performed and the machine or machines used.

Garrison
MACHINE WORKS, INC.
DAYTON 4, OHIO

ROUND TABLE Discussion

LAST OF THE MECHANICS

Is there such a thing as a "typical workman?" Should a shop worker, mechanic, or toolmaker dress down or up to his profession?

I KNEW THAT the subject of fastidiously-dressed workers would be brought to light eventually.

"There's good and bad in everything" definitely applies to the worker's dress. Naturally the kind of clothing a man wears depends upon the type of work he does. I've worked in grease-covered overalls, on my aching back beneath a steaming engine after which my woolen underwear was soaked with perspiration plus a seasoning of dirty oil. Then again I was more happily occupied in one of the most orderly establishments one could wish to be employed in. My fellow workers and I were all dolled up fit to kill—the only way in which we differed was in atmospheric redolence. I could not very well repair engines dressed in such fashion, nor could I have done this work, in which we smelled so sweetly, dressed in thick overalls.

Where a shop consists of workers whose jobs differ in degrees of cleanliness, I feel that the foreman has to be on his guard so that he doesn't jeopardize the fellow who isn't so well dressed as another. If a man isn't a slob in fact, he can soon develop into one in spirit when he is taken advantage of by thrusting the dirty jobs on him.

Toolmakers, as a class, are in the upper bracket of labor—on a par, I would say, with the patternmaker. Their occupation is such as to permit being well-dressed at their work.

I had a good one pulled on me in the early days of the first World War that convinced me of the necessity of thoroughly checking a man with pertinent questions before hiring him. It so happened that I was busy on an important matter at the time when a crudely dressed applicant approached me for a job.

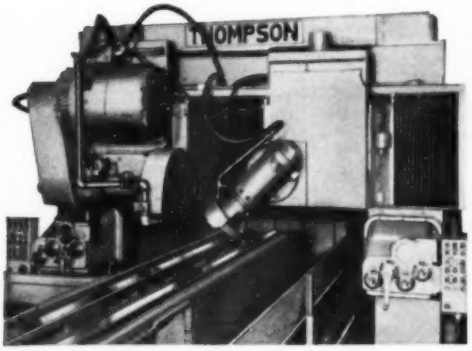
"What are you?" I asked, busily engaged in trying to fathom the workings of a piece of machinery in order to effect a repair. "Presbyterian," he shot back tersely. "Listen, man," I replied, looking at the fellow from beneath my arm; "Shoot your religion—I mean what are you as a worker?"

New Thompson Way Grinder Developments

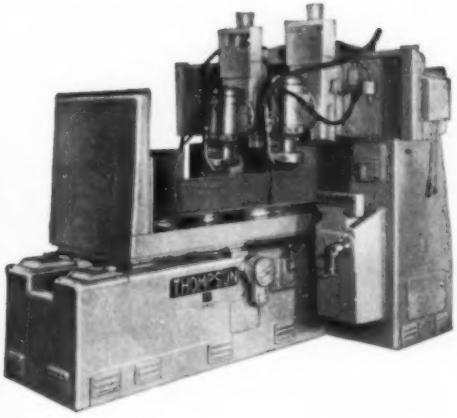
Reduce Costs ... Speed Machine Tool Production

Way Grinders now available with single, multiple heads, or combinations of horizontal and vertical heads and in sizes to meet all requirements.

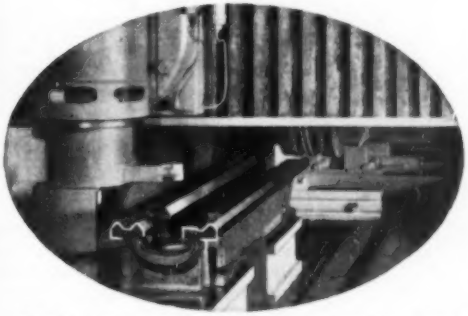
Thompson has produced machine tool way grinders in many types and sizes that have eliminated hand-work and produced economical and accurate ground ways. However, recently increased production grinding of ways has been made possible by many new Thompson Way grinding developments such as: automatic grinding and truing cycles; dual vertical or horizontal heads for grinding ways different heights; horizontal multi-wheel grinding and vertical side and undercutting head; Hydrail way grinding for giant columns or bed ways. Three of the new Thompson Way Grinders are shown here.



Designed especially for extremely large machine tool way grinding is this typical Thompson Hydrail Way Grinder. Size 48" x 48" x 192". Part: grinder bed ways.



One of several new Thompson Double Head Dovetail Way Grinders installed to speed work and hold accuracy in the plant of a leading lathe manufacturer.



Multi-wheel grinding with auxiliary vertical head. Equipped with horizontal spindle having dual spaced wheels and auxiliary inclinable spindle. The front contoured grinding wheel grinds the rear set of ways and the rear grinding wheel grinds the front set, with vertical head grinding the sides and undersurface of the ways and rack seat.

Write for details Today.

The Thompson Grinder Company, Springfield, Ohio

Thompson SURFACE Grinders

Copyright 1952—The Thompson Grinder Co.

Let us serve you too!

SIMONDS ABRASIVE CO.

Grinding Wheels

No matter what shape of grinding wheel you need cup, saucer, dish or cone . . . straight, flaring, tapered or recessed Simonds Abrasive Company's industrially-proven line has it.

No matter what type of grinding you do . . . snagging, surfacing, cylindrical or centerless . . . internal, tool sharpening, cutting-off or polishing . . . Simonds free data book lists the *right* wheel for it.

No matter where you are located north, south, east or west there's a Simonds distributor ready to serve you, too, with these accurately specified, quality controlled grinding wheels.

Write today for Data Book and name of your nearby distributor.

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO DETROIT BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

"Oh," he smiled, "a toolmaker."

A feeling of bliss came over me; that kind of animal was very scarce then.

"Come around in the morning dressed for work; I'll put you on."

He showed up dressed for work! He had on an old soft hat I used to see newly-arrived immigrants wear, a shirt that looked like it had taken its last trip to the laundry, and a pair of patched, super baggy-kneed trousers held in place by a couple of rawhide strings supporting an irregularly shaped leather apron about a quarter-inch thick.

I swallowed my astonishment as well as I could—there was a war going on and labor was hard to find so I took him over to a lathe to assign him his first job.

"I don't know nothin' about one of them things," he frowned.

"Thought you said that you were a toolmaker!" I shot back.

"I am—I make well-tools."

I led him over to old Bill and told him to put him to work. The next time I showed up around there he was oscillating the levers on the old steam hammer while Bill manipulated a large pair of tongs which gripped an eight-inch chunk of red-hot steel.

The new man turned out to be a good "toolmaker" and stayed with us for the duration. It only goes to show that you can't judge a man by the apron he wears, and that he usually wears clothes suitable for the job he is to do.

J Homewood
Ontario, Calif.

•

YOU SAY, "When toolmakers were honored men," Mr. Editor! They are still honored men and I pride myself in being one of them. The toolmaker's white apron is a symbol of a noble craft, one that is clean and very interesting.

It requires considerable thought and exceptional skill. No man who is slovenly in his dress can be expected to do anything else but careless work. Carelessness isn't in a toolmaker's dictionary. The results of his efforts must be *right there.*

I wouldn't go so far as to recommend the return of the swallowtail coat and mouse-gray spats, but we might emulate our skillful forefathers by clinging to the high hat as a mark of distinction. I'd recommend the spring-operated type, however, so as to conserve the checking space. Can't you just see Bill Mulligan flicking open his dignified headpiece and adjusting it carefully,

MAGNESIUM

can be FINISHED easily and economically!

Yes, putting a protective finish on magnesium can be done easily, economically and with satisfactory results. The procedures used do not differ greatly from those employed with other metals. After thorough cleaning, a chemical finish is applied and this is followed by the desired paint coating. The important considerations are the proper choice of chemical treatment and paint materials.

Through the efforts of Dow and paint manufacturers, thousands of paint test panels have been exposed to determine the best paint materials and the most efficient complete paint systems. As a result, paint systems are available which meet normal requirements and combine adequate protection with attractive decorative characteristics. Detailed recommendations are available for conditions under which magnesium is used, in service ranging from baked enamel systems for office machines to weather-resisting, air-dried primers and finishes for truck bodies and trailers.

For complete information on finishing methods call your nearest Dow sales office or write direct.

SEND TODAY for your free copy of MAGNESIUM FINISHING. It contains the latest information on all finishing methods.

THE DOW CHEMICAL COMPANY

Magnesium Department • Midland, Michigan

New York • Boston • Philadelphia • Atlanta • Cleveland • Detroit • Chicago
St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

Tool Saving Tips

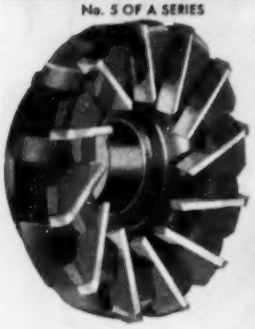
No. 5 OF A SERIES

Use These NEW

IMPROVED

Inserted Solid Blade

KENNAMILLS



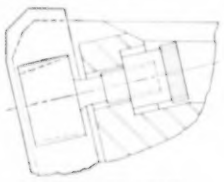
"KF" for STEEL
and Heavy Cast Iron Milling

"KF" radial type Kennamill has solid Kennametal blades. For production jobs on steel, and heavy cuts on cast iron. Standard sizes 6", 8", 10", and 12".

"MF" for CAST IRON

"MF" axial type Kennamill has solid Kennametal blades—more per inch of cutter diameter than the "KF"—for high production runs on cast iron. Standard sizes 6", 8", 10", and 12".

Simplify SET UP, DISMANTLING, MAINTENANCE



NEW! ONE PIECE WEDGE AND SCREW

The shank of the stud type, heat-treated alloy steel wedge extends through the cutter body. The wedge is pulled down, and blade secured, by turning the Allenut — easily accessible at the back of the cutter.

● These precision-built cutters feature strong, long-lasting, solid Kennametal blades—positioned, supported, and wedged by a new, improved design that assures maximum milling service from each unit of carbide consumed. (See sketch at left.) No threads in the cutter body; possibility of "freezing" eliminated.

Blades can be precision set. Wedges and blades for all sizes of each type cutter are interchangeable. For complete particulars, see Catalog 51, and Supplement 2.

KENNAMETAL *Inc.*, Latrobe, Pa.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTIVITY

then patting his toolbox lovingly before leaving for home.

Certainly clean clothes and a clean shop materially aid morale. At the present writing I have in mind a shop up in the Province of Quebec where the owner called in the services of an industrial engineer to tell them how to speed up production. The efficiency specialist took one look at the rat hole and then lost no time in expressing his views. "This is no manufacturing plant," he said seriously, "this is a fertilizer factory." The boss took the hint and the place was transformed. Production picked up.

There is just as much dignity in a man working with his sleeves rolled up as there is in one who chooses to display his diamond-studded links. Let us be dignified, but practical. The man who is so dolled up that he strangles from excessive dress certainly isn't going to turn out his best work.

Samuel Hill
Denver, Colo.

•

THERE CAN BE NO doubt that clean, bright workshops improve worker morale and one way in which the improved morale manifests itself is in the increased neatness and tidiness of the worker's dress. No employee is going to try and dress smartly and cleanly if he has to work in a depressing and filthy shop. Some managements in Britain have become interested in color dynamics which has completely transformed some factories from dark and dismal caves to bright,

"Hope you stick around after I break you in, bub. They always seem to get drafted, sick, or fired."

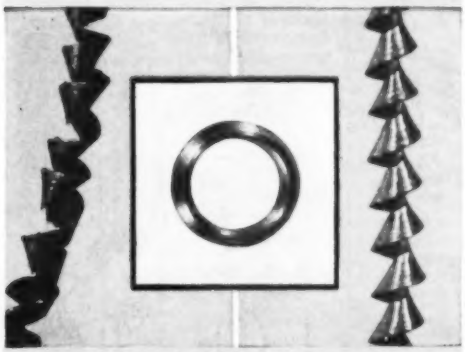
JOHNSON'S
WAX-CUT

The New Wax-Type Cutting Oil

Proved: Longer tool life, better performance, operator preference

Johnson's No. 120 Wax-Cut is a new *wax* cutting fluid designed for maximum cutting performance and minimum tool wear on automatic screw machines, gear cutting machines and other machine tools now using an oil-type cutting fluid.

Months of exhaustive testing at the University of Michigan and in nationally known production shops *proved* ***Wax-Cut*** has these advantages over sulphurized and chlorinated oils: Greatly increased tool life . . . better cutting results . . . *none* of the objectionable qualities of E.P. oils.



Metal curls from automatic screw machine making small part in the center. Clear metallic color of chip at right from machine using Wax-Cut shows extreme reduction of heat, compared with burned chip taken from machine using E.P. oil.

▶ Far longer tool life
The *greater lubricity of wax* makes possible a coolness of operation that cannot be approached by E.P. oils. In production tests, *Wax-Cut* extended tool life to a degree operators previously thought impossible!

▶ Increased feeds, speeds . . . improved finish
Made possible through *Wax-Cut's* extreme reduction of heat.

▶ Non-corrosive
Wax-Cut contains no chemically active additives such as sulphur or chlorine. It will not stain non-ferrous metals nor attack machine bearings, gear mechanisms or other parts.

▶ Far cleaner . . . odorless
This golden clear fluid has no objectionable odor, nor will it turn rancid.

▶ Lower daily consumption
Reduced heat means less smoking, burning, atomization and consumption! *Wax-Cut's* low viscosity minimizes the amount of "carry-off."

▶ No mixing, no mess!
No expensive man hours wasted in mixing additives.

▶ Lower operating costs
Longer tool life . . . less down time . . . uninterrupted production—these benefits of *Wax-Cut* can reduce *your* operating costs, too! A test in your shop will prove it.

▶ *Send for complete information today!*

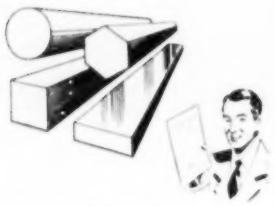
Industrial Products
Dept. AM8
S. C. Johnson & Son, Inc.
Racine, Wisconsin

A product of JOHNSON'S WAX Research

Which of these special steels do you need?

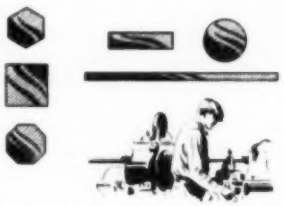
Call Ryerson for Quick Shipment

Right now, users of special purpose steels can get most of their requirements quickly—with one call to one convenient source. All the steels described on this page are in better-than-average supply at the Ryerson plant near you. All are high quality steels that conform to exacting specifications. Use this page to check the items *you* need, and save time by ordering them next time you call Ryerson.



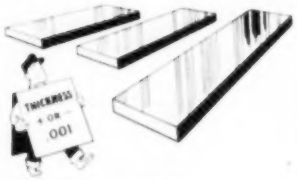
STANDARD ALLOYS

Rounds, flats, hex s, squares—hot rolled and cold finished—complete heat treatment guide with each shipment.



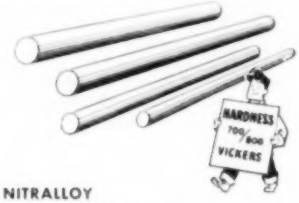
TOOL STEEL

Water, oil or air hardening tool steels. High in quality, economical in price. Hardening data with every shipment.



GROUND FLAT STOCK

High grade, non-deforming tool steel. Saves machining, speeds production. For accurate-to-size parts, tools, dies.



NITRALLOY

Develops extremely high surface hardness after nitriding. Unequalled for parts subject to abrasion. Large stocks.

OTHER PRODUCTS: CARBON STEEL BARS, STRUCTURALS, PLATES, SHEETS

RYERSON STEEL

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA CINCINNATI • CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

clean places which are a pleasure to work in.

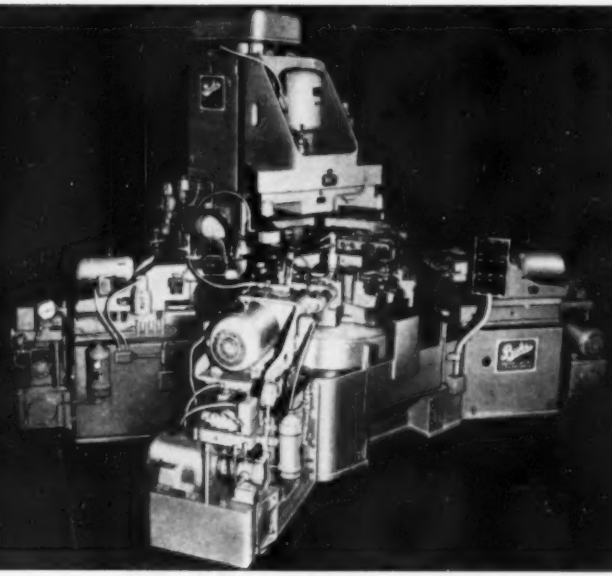
Not only has this increased light and color resulted in a production increase of 30% in one factory, but a complete revolution in the neatness and tidiness of both the worker's clothing and working habits resulted. The managing director of this factory told me that they never lost anything since going in for color, whereas, previously it was not uncommon to misplace several parts of some of the short-order work on which they were engaged.

In the southern region of Britain, we have some very fine, light, engineering plants which are on the whole outstanding for cleanliness of plant, building and personnel. It is rather significant that the most shining examples of this policy are the most efficient. In fact, some of these plants are offshoots of parent companies in the USA, but are under British management, and claim to have a higher productivity rate than the parent firm in the US.

It has always been a characteristic of the British workman that he dresses correctly for the job he has to do. The prevailing fashion for toolmakers, draftsmen and anyone engaged on fairly light precision work is the long overall coat—commonly known in the US as a shop coat. The fashionable color for a number of years now is white! The wearer of a white coat naturally tries to make it last him for five working days and therefore tends to keep his surroundings clean and shipshape. The inclination toward the white coat is spreading rapidly as plants become cleaner; there is no doubt that shop cleanliness and worker cleanliness are interdependent on each other.

"It looks like an industrial diamond to me!"

WHY DOAKES GETS FROM BANFF TO TALLAHASSEE



What are the travel and automobile agencies reporting every season? . . . That Joe Doakes—the typical American—is taking more vacation and traveling farther year after year . . . And here's one of the reasons why—this Buhr Five-Way Horizontal-and-Vertical Hydraulic-Feed Drilling Machine . . . the Machine which one of the world's leading Auto Makers uses "around the clock" for producing Rocker Arms in such volume and at such low cost that . . . Joe Doakes may afford to drive thousands of miles for vacations—literally from Banff in west Canada to Tallahassee, Fla.

Auto Maker Chooses This to Turn Out 880 Pieces an Hour for Utmost Economy

As each new model comes off the auto assembly lines, the battle to cut production costs becomes more intense. Not long ago, one of the big auto companies concentrated on how to make a certain rocker arm most economically.

Here Was Their Problem

To secure a piece of production equipment which would perform 7 operations on the rocker arm, including tapping, drilling, endmilling, chamfering and spotfacing—that was the problem.

As the company to design and manufacture the Special Machinery to solve this problem, they chose Buhr.

What the Machine Does

In general—it drills 8 holes, drills through 4 more holes, taps 4 holes, endmills 4 places, spotfaces 4 places and chamfers 4 previously drilled holes. It is equipped with 42" automatic Index Table and six-station Holding Fixture, loading four parts per station. Parts are automatically clamped while fixture moves from loading position into first working station, and are automatically unclamped while Fixture moves from last working station to unloading.

Specifically, the Machine does this—

Station 1—Load and Unload

Station 2—Vertical, idles; Horizontal, taps and drills (4) $\frac{7}{16}$-20 holes

Station 3—Vertical, endmills (4) $\frac{1}{2}$" Radius places; Horizontal, chamfers (4) previously drilled holes

Station 4—Vertical, drills (4) $\frac{1}{8}$" dia. holes $\frac{3}{16}$" deep; Horizontal, idles

Station 5—Vertical, drills (4) $\frac{3}{32}$" dia. holes through; Horizontal, spotfaces (4) $\frac{15}{16}$" dia. places

Station 6—Vertical, idles; Horizontal, taps (4) $\frac{7}{16}$-20° S.A.E. holes

PRODUCTION—880 pieces per hour at 100% efficiency.

Why Buhr Was Called In

Leading Automobile Manufacturers have done business with Buhr for more than a quarter-century. . . . They know Buhr's record for dependable Special Machinery . . . and for delivering on time. . . . They're familiar also with Buhr's excellent manufacturing facilities . . . and their experienced, trustworthy and specialized sales and engineering staffs. Consequently . . . for Special Machinery like this . . . it is second-nature for them to call Buhr.

For Details About Buhr

A comprehensive Catalog . . . or a personal call from a Buhr Sales Engineer . . . is yours for the asking wherever you are located in the United States! . . . For every problem involving this type of Special Machinery—including the type which helps Joe Doakes get from Banff to Tallahassee—phone, wire or write us.

BUHR MACHINE TOOL CO.
Ann Arbor, Michigan
Phone: Ann Arbor 2-5646—5980
Detroit WOodward 3-2126

Buhr ***SPECIAL MACHINERY . . . Leaders Make Sure with BUHR***

get more uniform work pieces from PROPER MACHINE TOOL TEMPERATURE CONTROL!

NEW OIL COOLER

specifically designed to control temperature of production machinery

Your problems of getting high production from your machine tools will be considerably lessened by the use of this new OIL COOLER. It has proved in actual production jobs that it can, through refrigeration, control the temperature of cutting oil or coolant, lubricating oil and hydraulic oil.

These advantages can result from its use . . .

- Uniform Work Pieces
- Uniform Oil Viscosity
- Longer Tool Life
- Less Tool Grinding
- Less Adjusting Time on Machines
- Cooler Work Pieces to Handle and Gauge
- Reduction of Oil Evaporation
- Increased Capacity

SEND FOR COMPLETE INFORMATION

Taco

TACO HEATERS, Incorporated

137 SOUTH STREET, PROVIDENCE 3, R

In heavy engineering plants, the standard uniform has settled down to the blue boiler suit, commonly known in the US as a coverall. Of recent years, the cut and general finish of these working clothes has improved considerably. They are belted at the waist and have turnback collars so that the machinist can show his clean shirt and necktie. 90% of the machinists in an average heavy engineering shop will be wearing the blue coverall and the general smartness and fitness for purpose of this garment cannot be bettered.

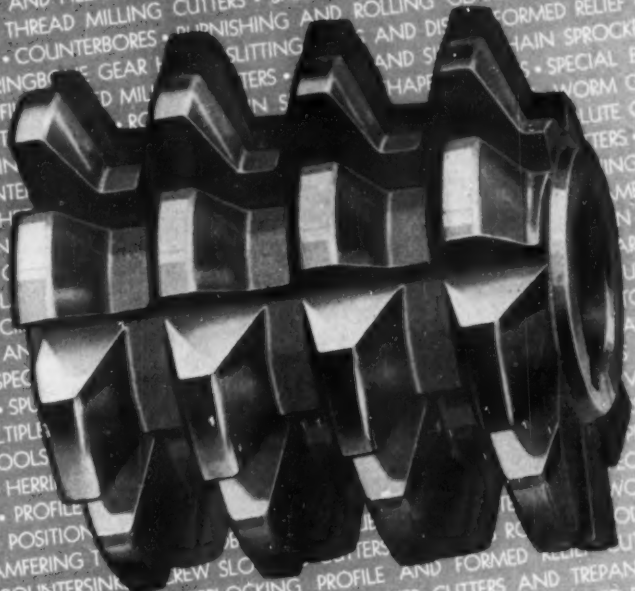
Uniformity of dress in British workshops goes back as far as I can recall. About 25 years ago, the standard dress for machinists was dungarees covered with a short jacket, all in the standard blue material. In those days, our workshops were very badly heated in the winter and this costume enabled the workman to wear plenty of clothing beneath his overalls and yet retain a fairly neat external appearance. These men were proud of their job and the overalls were a sort of uniform proclaiming their occupation. The clean overall service, or laundry service has been operating in Britain for many years. For a regular weekly payment, clean overalls are provided every week; the workman does not have any initial capital expense in purchasing the overalls, which are provided continually as long as the weekly payment is made. This system operates with considerable efficiency and economy.

"Aircraft plants got dames, shipbuilding's got dames—how come our grievance committee never got any dames working around here?"

FOR THOSE TOUGH *Special* JOBS

...DEPEND ON

National Tool Co.



● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

Make important production savings

with Jewel Brand Coated Abrasives!

SAVINGS OF 30% and more on your abrasive costs are possible with longer-lasting, faster-cutting Jewel Brand Coated Abrasive Belts. Add to this the increased productivity and lower labor costs, and you can easily see why it's well worth your while to use Jewel Brand Coated Abrasives.

RESIN BONDED JEWEL BRAND BELTS eliminate cooling fluids and shedding. In addition, all Jewel Brand belts have an exclusive *Velvet Joint* that adds many hours of productivity, since poor joints can cut belt life up to 80%.

MAKE THE WASTE BARREL TEST! Send us a letter size sample (preferably including the joint) of a used belt taken from your waste barrel. In most cases, Jewel Brand Abrasive Engineers can recommend a Jewel Brand Belt that will do a better job, faster and for less money. No obligation of any kind. Simply fill in the coupon and send with used belt sample. →

ABRASIVE PRODUCTS, INC.
561 Pearl Street
South Braintree 85, Mass.

Yes, I want to make the Waste Barrel Test!
Enclosed is sample of used belt from our plant.

NAME _____

POSITION _____

COMPANY _____

TYPE OF PRODUCT _____ MATERIAL _____

WE USE APPROXIMATELY _____ BELTS PER MONTH

BELT LENGTH _____

Nondescript and bizarre working clothes seem to be the fashion in young pioneer countries. A fairly standard form of dress adopted by Australian machinists is a black shirt in combination with blue dungarees, but on the whole, the Australian machinist seemed to wear anything that was lying around, including striped football jersey, aprons, dungarees, coveralls, broad-brimmed and battered hats, woollen sweaters and high-heeled riding boots! I worked in many plants in Australia and found that the dirtiest and most inefficient shops were manned by the grubbiest and untidiest workers.

In my own experience, I found the American workman extremely clean in his clothing but he did not seem to have any idea about the sort of outfit he should wear on the job. Apart from the coverall, none of the working clothes I saw in the US were functionally correct. The wide range of clothing worn in the American shops, which I saw, revealed the workman's inability to grasp the problem. It is really very simple; working clothes should collect the dirt and prevent it from adhering to the clothing beneath, or the person beneath. Obviously, working clothes should be of light texture so that they will wash easily and inexpensively. They should have the facilities of being donned and removed quickly and should not impede the wearer's movements when worn, nor should they have projections which will catch in machinery and cause injury. The coverall meets these requirements perfectly. It has the further advantage that anything,

"You'll find out yourself when they put you to working on stainless-steel jobs."

2 Duplicators in 1

with TWIN SPINDLES ..a GORTON Tracer-Control Development

Now engineers can plan ahead for stepped-up production with the duplicator they specify today!

Two sets of multiple blades duplicated simultaneously from single master blade on Gorton 9-J.

A Tip to Increase Defense Production

You'll find Gorton Twin-Spindle Duplicators ideal for long production runs of profiling or die and mold cutting operations—both roughing and finishing, in two or three dimensions.

If your present production schedule doesn't warrant twin-spindle operations, install a conventional Gorton Duplicator now. Whenever you feel the need, you can easily change to the twin-spindle head and ram assembly—cost of conversion only 22% of complete single-spindle machine. This doubles the ability of your duplicator to turn out work.

Whether you need a conventional or twin-spindle duplicator, Gorton's general catalog contains important information for you. Write for it today.

JOB FACTS

Description: Stainless steel impeller 9½" in diameter. The requirements were to profile from the solid 20 impeller blades 5/16" high by 2" long equally spaced as shown, and clean out metal in between at the same time.

Machine: Gorton Super-Speed 9-J Duplicator with twin-spindle head assembly and rotary tables used for indexing work pieces for each of 20 positions.

Cutters: Two high-speed steel, 4-flute, spiral cutters with square noses, ¾" dia., turned at 980 rpm for both roughing and finishing.

Time for Cutting: 4½ hours.

BONUS — one extra work piece finished completely, and identical to the other, from one simple master of one blade.

GEORGE GORTON MACHINE CO.

1508 Racine St., Racine, Wis., U. S. A.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1508.

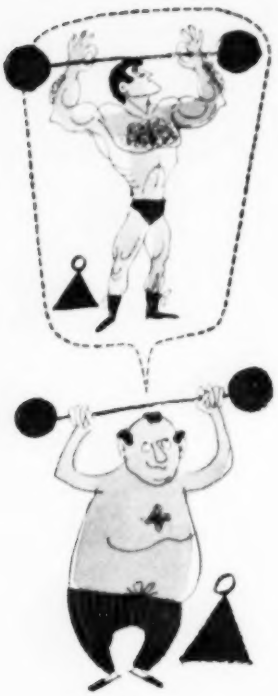
Firm _____

Name _____

Title _____

Address _____

City, State _____



want better taper?

Torrington Swaging Machines taper both tubular and solid work quickly, accurately and economically. Delivering 4000 hammer blows a minute, the swager gives the metal toughness and resiliency . . . utilizes all the stock.

Our booklet, "The Torrington Swaging Machine," describes the art of swaging and illustrates the complete line of Torrington Swagers. Write for your free copy . . . today!

THE TORRINGTON COMPANY
Swager Department
559 Field Street • Torrington, Conn.
Makers of
TORRINGTON NEEDLE BEARINGS

or nothing, may be worn underneath it, so that the wearer can adapt for changes in temperature.

One final point. The impression I always get when seeing odd styles of clothing in a machine shop is that the wearers have just dropped in for an hour or so and that their attachment to the industry is purely temporary. Nothing gives such an atmosphere of solidity and permanence to a machine shop as workmen dressed for the job in a uniform manner.

Clifford T. Bower
London, England

•

IT LOOKS to me very much as though Mullins is a recalcitrant individual — not at all a worshipper of the Trumania deal, but a lad who just refuses to be regimented by the New Deal and the C.I.O. More power to him.

My grandfather was originally a "bound boy," bound over to his employer for the term of fourteen years. Later in life he was just a handyman around a coal-breaker in Pennsylvania. I'd call those beginnings rather humble. Yet he went to work wearing a white shirt, a white celluloid collar, and a derby hat. On Sunday he flowered out in a high beaver hat, a tail coat and a cane. He was just an individual trying to put his best foot forward, and aiming to sell his appearance for the high dollar.

He wore that beaver hat for the same reason he wore a large silver watch, an imposing mustache, and an impressive, gold-plated watch chain with a dangling seal. He had personal pride, and his appearance was acceptable to his associates.

I saw no high beaver hat around the shops of forty years ago, but I saw many white celluloid collars and detachable white cuffs hooked on to blue chambray shirts, particularly among the toolmakers.

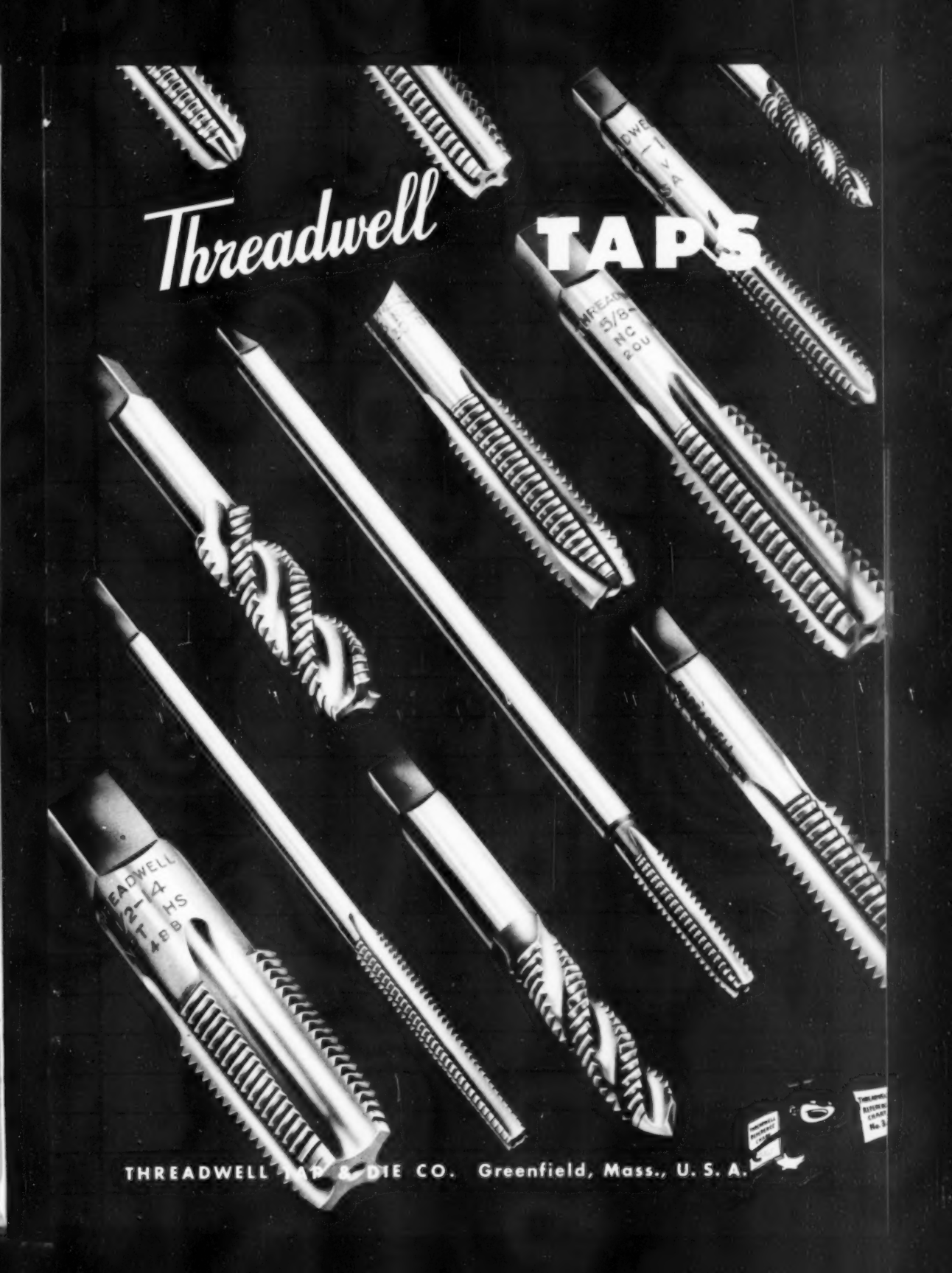
I personally knew many men who carried their lunches to the shops in paper toots, as they were called then; today they are just plain bags. These men used a paper wrapping for their lunches; they wouldn't carry lunch boxes because when they came home in the cool of the evening from work, all the porches were lined with women who were just watching. It took a courageous man to brave the stares of that rocking-chair brigade.

I knew many men who wouldn't be caught dead with a lunch box around them. That lunch box marked one as a shop worker—one of the lower orders. Even though we did work in shops, we thought of some higher things, but we weren't bragging about our shop jobs.

It's a mite different today. A boss can't give a raise to a single, individual, deserving toolmaker any more; he has to raise the rates of all toolmakers. That one fact tends to pull all workers down to the level of the lowest. Neither unions nor governments encourage any unusual display of individual dress preference or deportment; they want us all the same.

We pay the same income tax, fill out the same blanks, sign in the same place, on the same line as 50 million other Americans. That encourages regimentation, too. It wasn't quite the same forty years ago. I provided my own school books. If I had a Wentworth's fifth reader, and my neighbor had Sander's fifth reader, that was fine. The school provided us with some things of a common denominator, even if it

"Which one of you men want to make a setup for forming, shaving, facing, undercutting, drilling, tapping, and—huh?"


Threadwell
TAPS
THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

OFFSET for GRINDING TAP FLUTES

SIZE OF TAP	ANGLE OF RAKE OR HOOK														
	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	12°	14°	16°	18°	20°
	OFFSET FROM CENTERLINE OF TAP														
#6	.001	.002	.004	.005	.006	.007	.009	.010	.011	.012	.015	.018	.020	.023	.026
#8	.001	.003	.004	.006	.007	.009	.010	.012	.013	.015	.018	.021	.024	.027	.030
#10	.002	.003	.005	.007	.008	.010	.012	.014	.015	.017	.020	.024	.028	.031	.035
#12	.002	.004	.006	.008	.010	.012	.014	.015	.017	.020	.023	.028	.032	.036	.040
1/4	.002	.004	.007	.009	.011	.013	.016	.018	.020	.022	.027	.032	.037	.041	.046
5/16	.003	.006	.008	.011	.014	.017	.020	.022	.025	.028	.034	.040	.046	.052	.058
3/8	.003	.007	.010	.013	.017	.020	.023	.027	.030	.033	.040	.047	.055	.062	.069
7/16	.004	.008	.012	.016	.019	.023	.027	.031	.035	.039	.047	.055	.064	.070	.081
1/2	.004	.009	.013	.018	.022	.027	.031	.035	.040	.045	.054	.063	.073	.082	.092
9/16	.005	.010	.015	.020	.025	.030	.035	.040	.045	.050	.061	.071	.082	.093	.104
5/8	.006	.011	.017	.022	.028	.033	.039	.044	.050	.056	.067	.079	.091	.103	.115
3/4	.007	.013	.020	.027	.033	.040	.047	.053	.060	.067	.081	.095	.109	.123	.138
7/8	.008	.015	.023	.031	.039	.046	.054	.062	.070	.078	.094	.110	.127	.144	.161
1	.009	.018	.026	.035	.044	.053	.062	.071	.080	.089	.107	.126	.144	.164	.184
1 1/8	.010	.020	.030	.040	.050	.060	.070	.080	.090	.100	.121	.142	.163	.185	.207
1 1/4	.011	.022	.033	.044	.055	.066	.077	.089	.100	.111	.134	.157	.181	.205	.230
1 3/8	.012	.024	.036	.049	.061	.073	.085	.098	.110	.122	.147	.173	.199	.225	.252
1 1/2	.013	.026	.040	.053	.066	.080	.093	.106	.120	.133	.161	.189	.217	.246	.276
1/8 Pipe	.003	.007	.010	.013	.017	.020	.023	.027	.030	.033	.040	.047	.054	.061	.069
1/4 "	.005	.009	.014	.019	.023	.028	.033	.038	.042	.047	.057	.067	.077	.087	.097
3/8 "	.006	.012	.018	.024	.029	.035	.041	.047	.053	.059	.071	.084	.096	.109	.122
1/2 "	.007	.015	.022	.029	.037	.044	.051	.059	.066	.074	.089	.104	.120	.136	.152
3/4 "	.009	.018	.027	.037	.046	.055	.064	.074	.083	.092	.111	.130	.150	.170	.190
1 "	.011	.023	.034	.046	.057	.069	.080	.092	.103	.115	.139	.163	.188	.212	.238
1 1/4 "	.015	.029	.043	.058	.072	.087	.101	.116	.131	.146	.176	.206	.237	.269	.302
1 1/2 "	.017	.033	.050	.066	.083	.100	.116	.133	.150	.167	.202	.236	.272	.308	.345

Threadwell

Threadwell Tools do many jobs

they can do your tough ones

THREADWELL TAP & DIE CO. Greenfield, Mass., U. S. A.

were only a series of thrashings.

Individual initiative is rare today. Let a man turn to the right oblique instead of doing a right turn, and there is a cop, a general, a priest, a rabbi, a Mahomet, a superintendent, a tax collector, or an investigating Congressman present waiting to say, "Buddy, you signed on the wrong line."

More power to Mullins and all the other Mullinses who dare marry whom they please, live where they please, take a drink when they feel like it, vote for the man they like—as long as that act is an American act. I'm for them.

James K. Matter
Detroit, Mich.

•

PLAY BALL

Does time off for the baseball opener raise or lower shop morale? How can the problem be handled if you suspect half the men will take the day off anyhow? Some of our readers say—

WE MUST NEVER let baseball or any form of sport or recreation interfere with our job if we hope to be successful. In business where a time limit may be concerned or a deadline has to be met, the job must come first. However all work and no play makes Johnny a dull boy; therefore visits to the ball park should be arranged for weekends, holidays and evenings. By doing this, a conscientious worker will not let pleasure interfere with his job. Take cases, for instance, where irresponsible men have suddenly felt ill just before noon and asked to be excused for the rest of the day. They leave the plant and head for the ball game. Today these same men who have now become aware of their obligations no longer think they are fooling anybody and just don't happen to fall ill enough to take an afternoon off. These men now say that they cannot afford to lose time and are satisfied to wait until they leave the plant or office to get the results of the game.

Let us take the boss's side where this same condition exists. He may be a baseball fan and would like to see some particular game. If he has responsible men who can handle his affairs he could get away without affecting his business. However, it is less possible for an employer to get away if he cannot depend on his men, or if there should be an important business matter that needs attention.

A number of plants today are

AMERICAN CHEMICAL PAINT COMPANY
AMBLER PENNA.

Technical Service Data Sheet
Subject: RUST PROOFING WITH PERMADINE®

INTRODUCTION:

Ferrous metal parts that have been Permadized in a zinc phosphate chemical solution and then "sealed" with a rust-preventive oil such as "Granoleum" are effectively protected from rust-damage. In addition, if the surface is accidentally chipped or scratched, rusting is confined to the exposed area.

Rust proof coatings find many practical applications. During World Wars I and II most small arms were rust proofed by phosphate coating and impregnated with chromic acid and a rust preventive oil, or cutback petrolatum. This not only provided excellent corrosion resistance but also yielded a dull black non-reflecting surface. Rust proof finishes are now used widely on hardware, firearms, cartridge clips, metallic belt links, miscellaneous forgings and castings, tools, unpainted replacement machine parts, and many other similar items such as bolts, nuts, and washers.

THE PERMADIZING PROCESS:

For the most effective rust proofing of large or small work in large or small production, "Permadine" is used in tanks in an immersion process, with the bath heated to 190°-210°F., coating time 20 to 30 minutes. The coated parts are then rinsed in clean water, and then in a controlled dilute acidulated solution. After drying, a suitable corrosion-resistant oil such as "Granoleum" is applied.

Operations can be carried out with the work in crates, or hung from hooks, utilizing an overhead rail and hoists. For large volume production, automatic equipment can be used to mechanize the line. Small parts can be treated in tumbling barrels.

"PERMADINE" MEETS SERVICE SPECIFICATIONS:

The protective "Permadine" finish meets U.S.A. 57-0-2C; Type II, Class B, and equivalent requirements of:

MIL-C-16232, Type II
U.S.A. 51-70-1, Finish 22.02, Class B
AN-F-20
Navy Aeronautical M-364
JAN-L-548

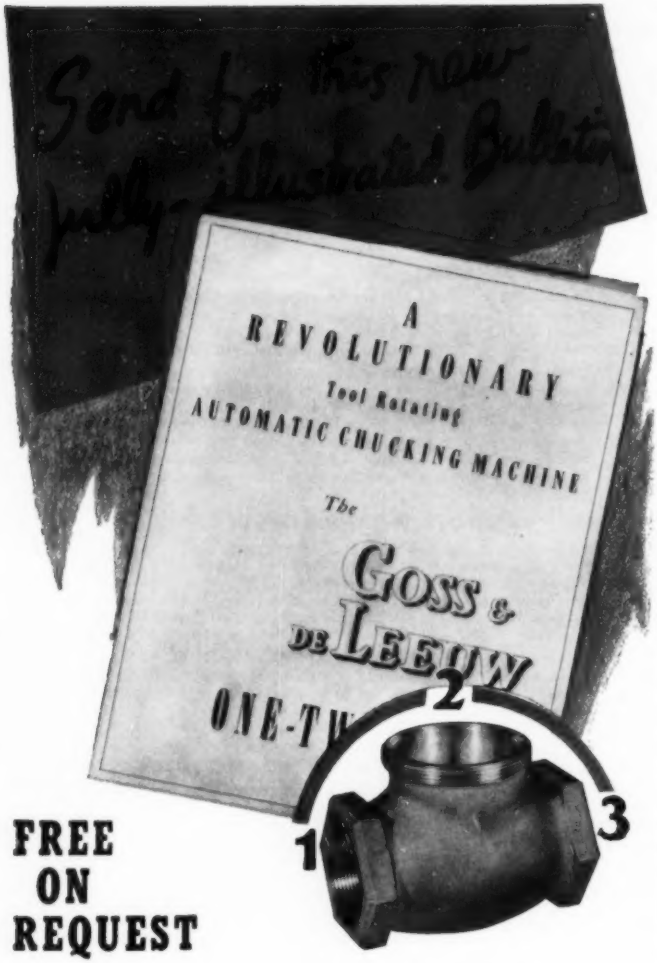
"PERMADINE" DATA CHART

Type of coating	Zinc phosphate
Object of coating	Rust and corrosion prevention
Typical products treated	Nuts, bolts, screws, hardware items, tools, guns, cartridge clips, fire control instruments, metallic belt links, steel aircraft parts, certain steel projectiles and many other components
Scale of production	Large or small volume; large or small work
Method of application	Dip Barrel tumbling, racked or basketed work
Equipment notes	Immersion tanks of suitable capacity. Cleaning and rinsing stages can be of mild steel. Coating stage can be of heavy mild steel or stainless steel.
Chemicals required	"Permadine" No. 1
Pre-cleaning methods	Any common degreasing method can be used. Alkali cleaning ("Ridosol"), Acid cleaning ("Deoxidine"), Emulsion-alkali cleaning ("Ridosol"-"Ridoline"); vapor degreasing, solvent wiping, etc., are examples. Acid cleaning may need to follow other cleaning methods if rust or scale is present.
Bath Temperature	190° - 210°F.
Coating time	20 - 30 minutes
Coating weight range Mgs./Sq. Ft.	1000 - 4000
Technical Service Data Sheets	No. 7-20-1-2 T. M. No. 5

CHEMICALS ACP PROCESSES

WRITE FOR FURTHER INFORMATION ON "PERMADINE" AND YOUR OWN METAL PROTECTION PROBLEMS

CHEMICALS ACP PROCESSES



FREE ON REQUEST

Here are the answers to most of your questions as to what "ONE-TWO-THREE" means in describing this outstanding development of Automatic Chucking Machines by Goss and De Leeuw. You'll be interested not only in the revolutionary design of the machine itself, but also in its extraordinary performance—and how it is possible to handle from one to three operations—in sequence or simultaneously without changing set up.

Get this interesting, informative Bulletin NOW—by merely asking for it.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

filling the needs for defense, so if we neglect these supplies, baseball cannot take its place. There are men and boys doing a job somewhere who would also like to stop work and just *listen* to a ball game. If we keep this in mind, it will be easy to stay on the job.

C W McLarty
Woodhaven, NY

•

TRANSFER OR TAKEOVER?

THE INTEREST of the firm is the first consideration whenever changes are made in personnel, regardless of any selfish attitude of the individual.

I would think that it would be a feather in Ed's cap to have one of his men given the opportunity to handle another department. Though the loss of Millikin might be hard for him to take after going through all the effort in training, it should be remembered that there are others who may be as good—if not better—to handle things. No man is indispensable.

When I was a young squirt full of that tingling ego that permeates youth I thought the shop would go to pot when I pulled out because I was refused an increase in pay of five cents an hour. The shop still runs today, and has grown considerably. The chances are that it would have made better progress had I quit sooner.

If Millikin possesses the necessary characteristics to handle the milling department, why not let the man be advanced? Ed should take the attitude that his loss is the other man's gain and by just that he is certain to gain more than his loss eventually. Matters of this kind should be

"There's only one thing that seems to be standing in the way of your promotion—all that poker money you won."

Double-duty filing at every stroke!

Only Heller NUCUT gives it to you

HELLER NUCUT WAVY TEETH FILE

Reg. U.S. Pat. Off. Pat. No. 2027029

WITH A NUCUT YOU FILE MORE, FASTER, BETTER WITH LESS EFFORT

NUCUT files are *different*. You can *see* the difference. Just hold the file at an angle—and you'll spot the exclusive wavy pattern made by NUCUT's *two* sets of teeth. It's this patented wavy construction that gives you superior cutting power.

The teeth do two jobs at every stroke. The coarse teeth cut fast, clean, without skidding. The fine teeth leave the surface smooth. Just as if two files were working at every stroke.

See your distributor. He knows NUCUTS, and will help you in selecting the right sizes, shapes and cuts.

HELLER BROTHERS COMPANY
A New Jersey Corporation
America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO

Select right file for job. Files come in many different sizes, shapes, cuts and types. So, make sure you select the right file for the job.

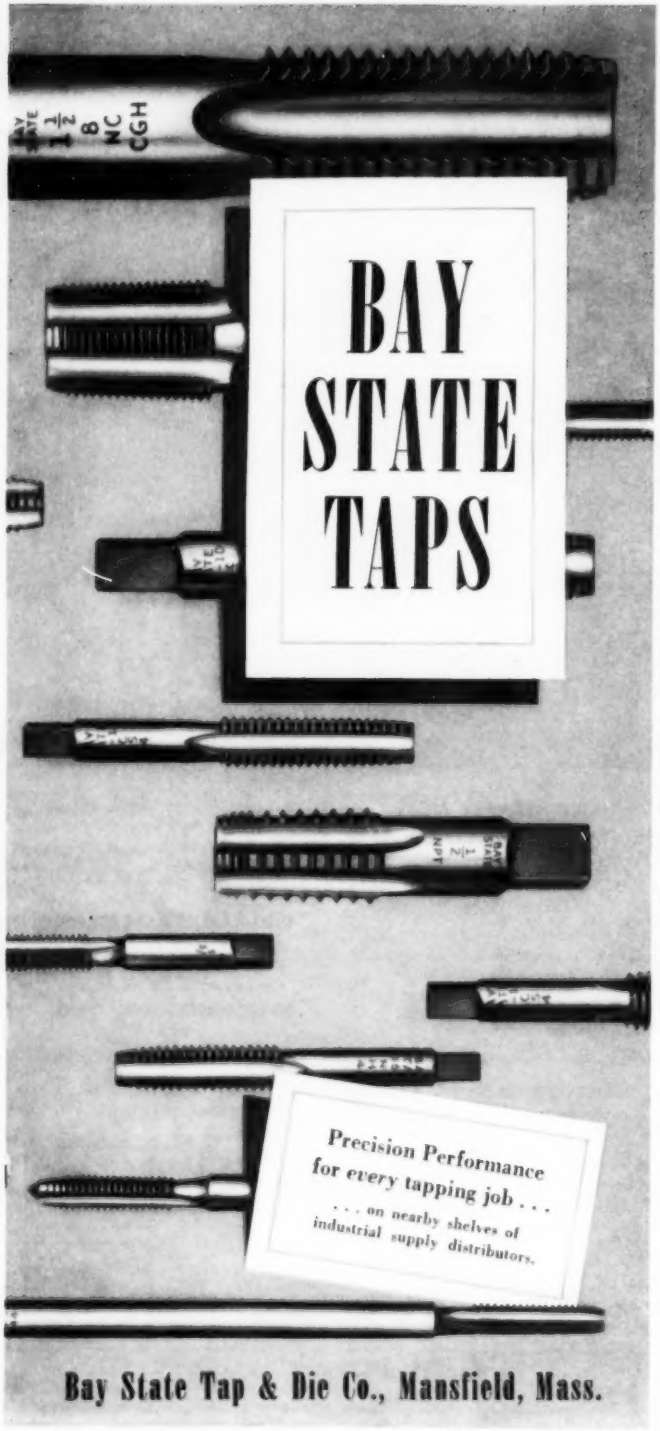
WRONG: Don't use a coarse file on fine work.

WRONG: Don't use a fine file on coarse, heavy work.

RIGHT: Fine work requires a fine file.

RIGHT: Coarse work should be handled with a coarse file.

CONTACT YOUR INDUSTRIAL DISTRIBUTOR for our FULL LINE of American Pattern, Swiss Pattern, Milled Curved-Tooth and Rotary Files, Rasps, Machinists' and Carpenters' Hammers, Blacksmiths' and Farriers' Tools, Bricklayers' and Plasterers' Trowels, Craftmaster Scrapers, Chisels, Punches, Masterenches and other quality tools.



considered from the broad viewpoint and Reynolds seems to be the one who can do it. What if Ed does have to train a new man to take over; it's all in the game of production.

If it were a common thing for Reynolds to hinder the success of Ed's efforts by repeatedly taking away his good men, then there would be good cause for gripe. The wheels of industry will continue to revolve about unselfish cooperation and consideration for the other man's interests.

J Homewood
Ontario, Calif.

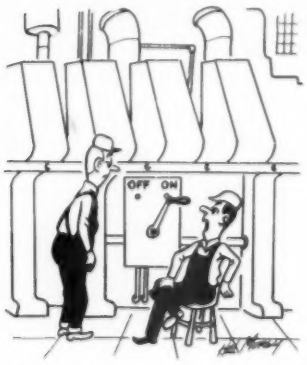
•

DOUBLE TROUBLE

THE MULTISHIFT OPERATION within a plant always has its drawbacks. In nearly every plant, the old story of the night shift being the shift to damage equipment or make wrong products seems always to persist. How this idea ever got started is hard to say, but the supervision on the second and third shifts are certainly the fall guys for the company, or at least so it appears.

Now in the solution of just such a problem which faces each and every company operating more than one shift, we must try to analyze the reasons for such conditions existing. Why should foremen accuse each other and why should workers want to see other shifts embarrassed? How does higher supervision tie into the picture and finally, what can be done to reduce or eliminate the conditions?

First let us look at the foreman picture. Who are the foremen on the other shifts? Sometimes they were selected for their ability to handle situations without excess supervision. They were chosen by top management because they could think clearly and perhaps meet conditions which arose in a manner that was quick



"I'll be glad when I can retire and take it easy!"

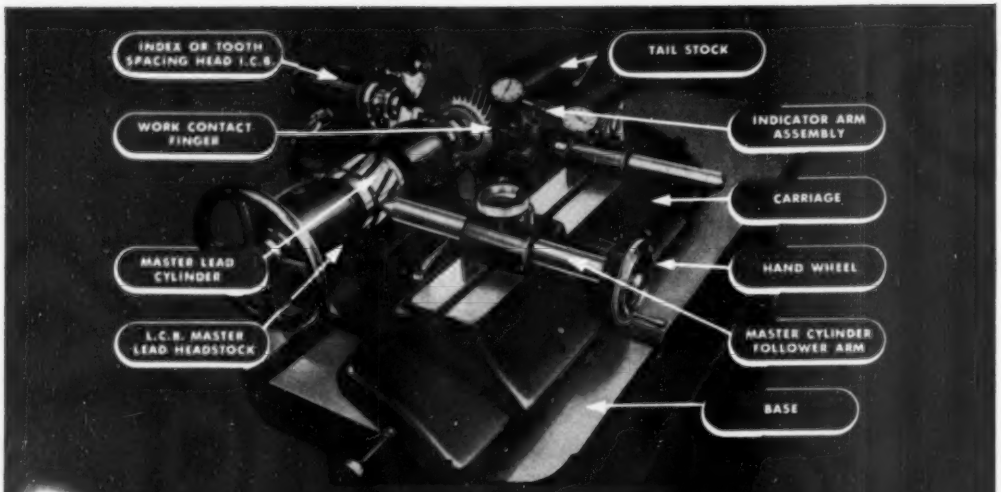
Measure with Confidence with Tumico

There was a time when "hair-line" accuracy was industry's critical standard of measurement. Today, Tumico instruments divide and redivide that mythical "hair-line" many times.

Tumico precision measuring tools are being used by a large segment of American industry. We cordially invite your inquiries on how to solve standard and special production measuring problems.

TUBULAR FEATHER TOUCH **MICROMETER CO.**

ST. JAMES, MINNESOTA



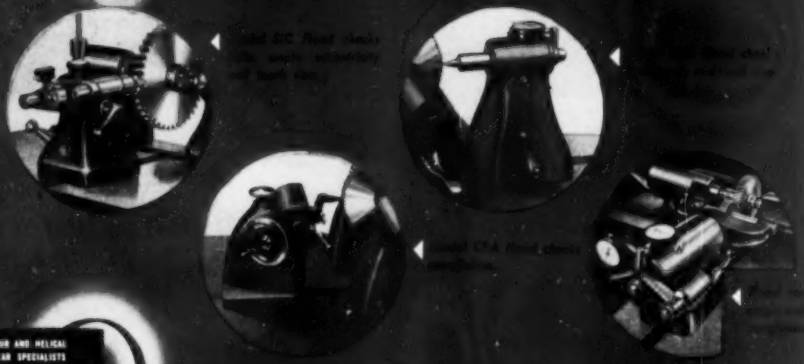
LOCATE AND EVALUATE GEAR ERRORS

QUICKLY and ACCURATELY

Errors in each of the several gear characteristics can be quickly analyzed and evaluated on the Red Ring Universal Gear Checker.

This instrument with 5 interchangeable heads indicates errors in tooth size, spacing, helix angle, lead, eccentricity, parallelism and wobble. This Checker is rugged enough for the production shop—sensitive enough for the gear laboratory—simple enough for the average shop man to use effectively. No special skill is required—ideal for the rapid inspection of mass-produced gears.

For more detailed information and specifications ask for Bulletin C-51-6.



SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

and efficient. This has not always been true, but sometimes this has been a condition. Under this set up the first-shift foreman, not knowing the other foremen too well, has sometimes felt that he must always be right in order to better impress top management. Human nature plays a big part in this thinking. We are all human and we all like to show our ability. Some of us like to do this even at the cost of other people's feelings.

A first-shift foreman trying to indicate to management that he is a better operator than the other supervisors can create and keep alive the friction of multishift operations. Always remember to put yourself in the foreman's place. None of us likes to be wrong, and many are willing to see glory come their way regardless of how it is gained. Broken equipment or loss in production can easily be passed along to the next shift because no one is available at that specific moment to prove or disprove that it didn't happen on the particular shift.

Now our second point. Workers always appear to be more human, perhaps, than supervision. Therefore they quickly grasp a chance to crawl out from under and clear themselves of any responsibility for bad work or machine breakage. Most of the workers do not even know who takes over their jobs on the other shifts except by name. Sometimes this is not the case, but in most instances knowledge of the man is just a speaking acquaintance when he is passed in the washroom at the end of a shift. So we do not have the same feeling as the workers of a shift have toward each other. These workers realize that Joe or Johnny or Tom can do certain work with great skill and thus a respect toward their specialty

"How did you make out on the aptitude test?"

"Can't you think of anything but your new Allison Catalog!"

If abrasive cutting is already a production function in your plant . . . or if you're just considering its possibilities . . . you will want a copy of the NEW Allison Catalog. Information on both wet and dry cutting of various materials . . . information on abrasive cutting machines and their maintenance . . . recommendations for the selection of Allison Abrasive Wheels . . . written by *specialists in abrasive cutting for over 30 years!* Send coupon today . . . your copy will be mailed promptly.

Allison
ABRASIVE CUTTING WHEELS

THE TOUGHER THE CUTTING JOB . . .
THE BETTER THE OPPORTUNITY FOR
abrasive cutting

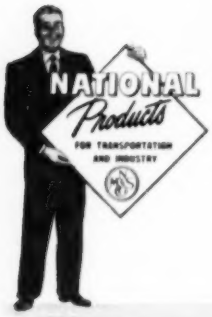
BAL-51

THE ALLISON COMPANY
256 Island Brook Ave., Bridgeport 8, Conn.
Gentlemen: Please send me a copy of your new catalog.

Name _____
Company _____
St. & No. _____
City _____ *State* _____

Castings by National

selected for Quality and Dependability



Products bearing these familiar trademarks have all established enviable reputations for quality and dependability.

These manufacturers *continue* to procure castings by National—one of the Nation's largest founders.

NORTHWEST · EATON · MW · Kelsey-Hayes · AC · Budd · CATERPILLAR · American Standard Products · TIMKEN Detroit AXLES · BALDWIN BLH LIMA-HAMILTON

National's unparalleled experience in producing malleable, heat-treated malleable, and steel castings is at your disposal. Sales offices and engineering facilities are located at all five strategically located plants. A-5345

PLANTS LOCATED IN Sharon, Pa., Cleveland 6, Ohio, Indianapolis 6, Ind., Melrose Park, Ill., and Chicago 50, Ill.

SEE "This Moving World"

A 16mm technicolor film. Narrated by Edwin C. Hill, this 27-minute film tells how malleable iron is made . . . tested . . . used . . . how its production economy, ductility, machinability, toughness will give you a better finished product. Available for group showings.

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY
CLEVELAND 6, OHIO Est. 1868

is built up, thereby making better teamwork.

Don't fail to see that while most of the complaints appear to rise from the day shift regarding the other shifts, yet when other shift personnel is questioned the same answers are found. It is the other shift who did something or did not do it, as the case may be. How can we cure this disease—for it is just that. It is a disease that tends to reduce productivity and also causes ill feeling.

The factors involved must be stated.

1. Multishift operation wears out equipment.

2. Multishift operation calls for better maintenance.

3. Multishift operation requires better personnel training of supervisors.

If we realize that to operate a machine three shifts per day actually means that the machine has operated for three days instead of one as is usually figured, in a year's time a machine so operated is actually three years old. It can quickly be seen that as machines progress at this rate they will wear out faster than on a one-shift operation. Wear causes errors in production, thus poorer work sometimes is caused by this factor. Closely tied to this is maintenance. Three-shift operations require better maintenance programs than a single shift operation. Lack of maintenance can cause failure of machines for which the other shift foremen are blamed. It is too bad that such things happen but without proper respect for multishift operation by top management, it usually is the basic cause for the ill-feeling between shifts.

"That's where the foreman's wife presented him with triplets."

Better personnel programs for supervisors can, perhaps, more quickly improve relationships than any other means. Make sure the supervisors know each other and be certain that all supervision is equally trained to the job.

The overlap of foremen on shifts is a successful way to see that each shift knows exactly what the last shift has done. No guesswork; no buck passing, and schedules can be better maintained. And surprisingly enough, there is less willingness to condemn the next shift.

How can this stop the workers? Always remember that your workers act as the foreman acts. If he is always ready to sound off about the second shift, you will find your workers do also. But if the foreman does not condone this practice and top management does not condone it, then the tendency to blame the other fellow eases off.

Remember also—all of you work for the same company and it is your duty to see that your foremen are given the proper chance to cooperate—help them to solve these problems.

Charles D Townsend
West Hartford, Conn

•

EVER SINCE I was a machinist apprentice, more years ago than I care to remember, multiple-shift operation in any shop has meant more money in the pockets of the aspirin vendor because of the increased wear and tear on the nervous system of the supervisory force. Al is just going through what countless foremen and department heads have experienced before him and a hundred years hence the super-mechanics of another era—faced with the same problems—will be griping in the same old way.

Nine out of ten production lapses are due to that unpredictable factor, the well-known human element. To be sure, multiple-shift operation imposes an increased burden on machine tools. Even with efficient operation and the best of care, parts will wear out and have to be repaired or replaced, but in very few instances do these parts fail without warning. An alert operator can usually tell when his machine is not functioning as it should, and do the obvious—notify his superior or the man responsible for maintenance.

To do the obvious is simple, but the sad fact is that we humans are impatient with simplicity, with the result that unnecessary complications ensue. For instance, our friend the machine operator notifies the

From finishing hand tools . . .

to sanding forged aluminum

Armour Backstand Belts do the job right

For the thousand-and-one jobs the backstand belt can do easily and profitably, for the other thousands of jobs coated abrasives do so well, Armour has the answer—there's an Armour coated abrasive to do *your* job right.

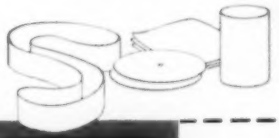
Toledo Steel Tube Co. saves time

2 hours per operation per day—that's the time the Toledo Tube Co. saved by switching to backstand belts. In removing burrs and grip marks from tubing, they found Armour Coated Abrasives cut faster, last longer, give a better finish.

Armour has one of the most modern plants in the coated abrasives industry. Belts are only one of the many forms of coated abrasives available to you — more than 30,000 different varieties in grip size, backing, etc. Sheets, rolls, discs, tubes — and specialty sizes to meet your specifications, if you need them.

Conserve your stocks of coated abrasives. Write for our free booklet on "How to Store Coated Abrasives."

We recommend buying through your industrial distributor



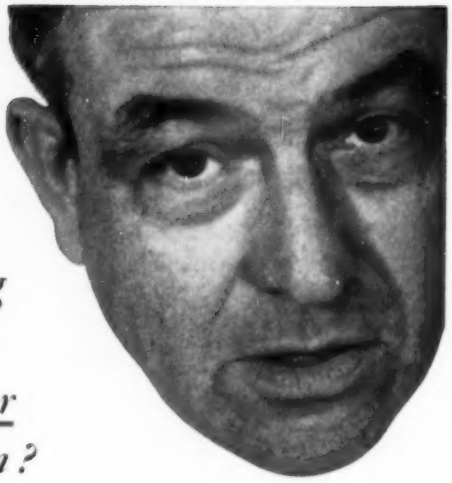
ARMOUR
Coated Abrasives Division

MAIL THIS COUPON TODAY

Armour and Company • North Benton Road • Alliance, O.

Please send me the free informative booklet "How to Store Coated Abrasives."

Name .....
Title .....
Firm .....
Address .....
City ..... Zone ..... State .....



which roller bearing is best for your problem?

. . . obviously one that is best suited to your machinery's particular requirements. You would want maximum capacity, smooth precision performance, long life, dependability with the least maintenance and of course an adequate range of sizes. McGill MULTIROL Bearings have been delivering this insurance for successful machinery for over 20 years. With today's increasing production demands it will pay you to specify MULTIROL. Write for complete information in the new McGill Catalog No. 52 today.

maintenance man that the machine isn't running as it should. But it happens to be near the close of the shift and the maintenance man is busy on something else; he probably asks the operator if he can finish out the shift without trouble, and, receiving an affirmative answer, makes a mental note to notify the trouble-shooter on the other shift, and forgets to do so.

Or perhaps the operator, knowing he can finish his quota without too much trouble, and not caring too much about his partner on the other shift anyway, mentally decides to "let the next guy worry about it," and doesn't notify anyone.

There are so many variations on this theme that one could go on for hours, but in every case they spell out trouble for the supervisor and unhealthy feuding betwen shift personnel.

There is also the physical aspect of night work to be taken into consideration. We all know that night work imposes more of a strain on the human body than normal 8-5 operation; one's sleeping and eating habits have to become readjusted and the family man's whole pattern of domestic relations undergoes drastic revision. As one oldtimer used to say, "You're bucking nature all the way, and sooner or later there has to be a reckoning."

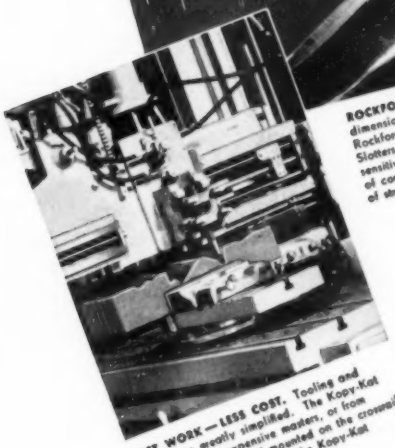
Of course, if friend Al has never been a night-shift boss, he can't be expected to sympathize with his opposite number, but the least he can do is have a talk with him and try to find out what causes all the breakdowns. One man I used to work under made a point of going around to every machine before turning over

"It's cellophane—it doesn't interfere with my work—and I hate getting my clean overalls all dirty!"

DUPLICATES FORMS DIRECTLY!

with ease of straight-production machining

ROCKFORD KOPY-KAT transfers two or three dimensional forms directly to the tool head of Rockford Hydraulic Shapers, Planers and Slotters. The hydraulic duplicator valve is so sensitive, so exact, that positive duplication of complex forms is done with the ease of straight-production machining.



FAST WORK — LESS COST. Tooling and fixtures are greatly simplified. The Kopy-Kat transfers from inexpensive master, or from the original form itself mounted on the crossrail or table. This view shows the Kopy-Kat planing the two-dimensional cross section of a shear blade.

DIRECT TRANSFER — NO INTERMEDIATE MOTIONS. Inaccuracies are eliminated by the absence of intermediate motions. Here, a Rockford Kopy-Kat is shown reproducing a plow-share die . . . a good example of three dimensional reproduction.

● A Rockford Machine Tool Co. representative will show you how the Kopy-Kat can simplify your form-machining problems. Let him give you the complete story, with examples, on many varied and complex mathematical curves and shapes. For a quick picture send for Data Sheets 524.

Hy-Draulic

ROCKFORD MACHINE TOOL CO.

3500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

Having Tool Crib Trouble?

Here's how to stop crib troubles with step-by-step procedure used profitably in hundreds of plants

BULLETIN **FREE** ON REQUEST . . .
tells how McCaskey Tool Crib Control works to:

prevent hoarding, theft and loss of tools and gages loaned to employees;
recover idle tools;
cut crib inventories;
reduce tool breakage;
locate each tool, loaned or in crib;
eliminate delays, saving man and machine time;
stop arguments and otherwise speed service;

. . . all this and more, too, with no increase in crib personnel.

Complete control of your tools and gages will save dollars and headaches in the months ahead. Mail coupon for your copy today.

THE McCASKEY REGISTER CO.
ALLIANCE, OHIO

Send me the facts on McCaskey Tool Crib Control.

Name

Position

Company

Address

AM 8-52

McCaskey
INDUSTRIAL CONTROLS
PRODUCTION • INVENTORY
TOOLS • COSTS • PAYROLL
THE McCASKEY REGISTER CO.
ALLIANCE, OHIO
McCaskey Systems, Ltd., Galt, Canada
The McCaskey Register Co., Watford, England

his shift. If the operator had anything to report he was expected to tell the foreman; otherwise the machine was presumed to be okay. He made an agreement with the other shift boss to make the same inspection, and the arrangement seemed to work out fine. I don't recall an unreasonable amount of downtime on either shift.

In the final analysis, I am of the opinion that multiple-shift operation is at best a necessary evil, and like all production maladies—what can't be cured must be endured.

It has been my experience that multiple shifts can and do operate successfully with the right supervision. If a supervisor gets the idea that his own shift can do no wrong, then, as the politicians say, "It's time for a change." It looks like friend Al is going through such a phase.

Robert S Alexander
Greenville, RI

•

FINDER'S FEE

MOST EVERY EMPLOYEE has a sincere desire to get ahead. As you walk through a factory today you may wonder if that is true, but out of every group you will find employees who will take a cut in pay if necessary, to get on a job with a ladder to it. They have another desire: a good place to work.

I do not mean working conditions such as dust, dirt, grease or oil, but conditions of the place in general. Conditions such as foreman attitudes, development of skill, a chance to show one's individuality. Employees like to work at plants that provide medical care, insurance, paid holidays, sick benefits, vacations and

"I'm trying to keep my home safety record up to the shop's."

Among other obligations...

When an order is accepted the obligation to supply the commodity as stated in the contract is routine. But every purchaser knows that there are many other and additional services that the seller can render which serve the convenience and interests of the customers.

Along with every order accepted by the Bunting organization is also accepted the obligation to cooperate with the customer as well as to deliver the items as specified.

Ask *any* Bunting customer.

The sleeve bearing is not complex in structure; it conforms readily to design requirements; it is easily installed. Cast Bearing Bronze is the most adaptable of all sleeve bearing materials; it possesses excellent anti-friction properties. With proper film lubrication, its coefficient of friction is as low as can be obtained with any other bearing type. A successful Bunting Bronze bearing installation is readily attainable. We ask the opportunity to work with you, and to quote on your requirements.

Bunting

BRONZE BEARINGS • PRECISION BRONZE BARS • BUSHINGS

THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

Get up to 20% EXTRA PRODUCTION with

WILLIAMS

IMPACT

"SUPERSOCKETS"®

- EXTRA-TOUGH ALLOY STEEL
- FULLY HEAT-TREATED
- DESIGNED FOR QUALITY PERFORMANCE
- MACHINED FOR A PERFECT FIT

HOW? The built-in durability of Williams Impact "Supersockets"® outlasts ordinary types... gives you that *extra* on-the-job time which means more production at less cost. A performance comparison under your working conditions will point up the superiority of Impact "Supersockets"® Available in ¼, ⅜, ½, ⅝, ¾, 1 and 1½" square drive sizes... over 300 sockets and accessories... they can be used with all types of power wrenches and nut runners... as well as Williams hand socket drivers.

Want to know more?... Write us for detailed, illustrated Catalog A-100. Or ask your Williams Distributor.

J. H. WILLIAMS & CO., 417 Vulcan St., Buffalo 7, N. Y.
Drop-Forgings and Drop-Forged Tools

Williams Impact "Supersockets"® are sold through your Distributor who knows and can supply your needs promptly — correctly.

humane treatment from the fellow they work for.

This fellow they work for is a very important factor. The employee is not concerned with the president, vice president or any other executive except his foreman. One of the reasons people joined unions was because they could not find expression within the company area.

A good place to work is represented by the services of the company. Personal help, attention, encouragement or even a good union are important factors. If you have these things you will have the kind of employees you want besides a long list of people who want to get in.

A E Salmons
Philadelphia, Pa.

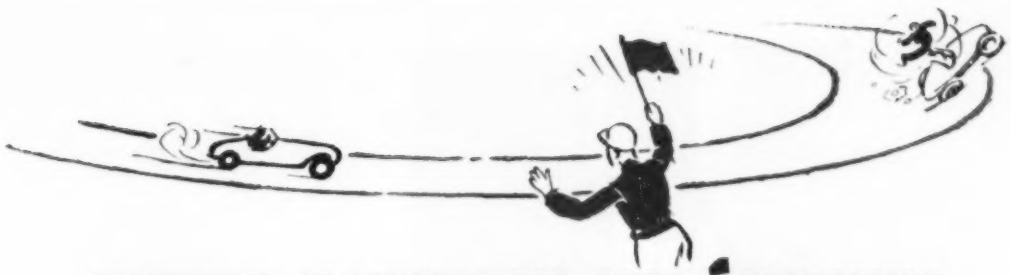
•

ALCOHOLICS FORALLEVUS

THE USE of alcohol in any of its forms when taken in moderation need not be completely condemned. However, where this point of moderation ends and excess begins is really the problem which faces the world today. It not only hits the industrial world but also has bearing on the social world. It may affect our lives through the foolishness of those who drink and drive on the roads, or in many other ways.

How can we in industry today tell whether an employee has had one drink too many? How, when alcohol affects individuals so differently can we be sure that the employee is not capable of doing his job properly and that he will not only create accidents but may thereby injure himself and cause injury to others.

The only method of dealing with such a problem is the elimination of the employee who decides to "have a few" before reporting to work. This does rule out those who may have taken only one beer or a glass



INDUSTRIAL SPEEDWAYS, TOO, NEED PROTECTION

MAXITORQ

automatic

OVERLOAD RELEASE CLUTCH

The tremendous expansion in the use of high production automatic machinery, especially in the bottling, packaging, labeling, wrapping and kindred fields, calls for added protection thru safety controls in power transmission equipment.

For this purpose we offer the Maxitorq floating disc Overload Release Clutch which automatically and instantly releases when the nature of an overload is either a heavy shock or suddenly applied load of a magnitude substantially greater than normal driving load. In such instances the machine mechanism may be clogged, products damaged and operator injured...all of which means expensive down-time.

The Overload Release Clutch performs most effectively and prevents heavy overload destruction. When jammed condition is cleared the clutch is re-engaged and operation continues. Simple fingertip adjustment sets the clutch to transmit normal running load. For original equipment, specify Maxitorq. There are six standard capacities, ¼ to 5 H.P. @ 100 r.p.m.

New catalog gives complete engineering specifications; shows complete line of standard clutches and driving cups.

ASK FOR CATALOG No. AM8

THE CARLYLE JOHNSON MACHINE COMPANY

MANCHESTER • CONNECTICUT

1C/88

Water hardening steels with controlled hardenability for every water hardening tool steel need. For service, for quality, look to Columbia — producers of fine tool steel by the electric process.

COLUMBIA TOOL STEEL COMPANY

Main Office & Works — Chicago Heights, Ill.

of ale, but how can a supervisor be *sure* that was all that an employee consumed? Certainly the employee will not commit himself.

Many companies have established rules of discipline which state that an individual who has been drinking reports for work he or she is to be sent home. This is done for the protection of three things—company property, employee safety and the safety of all other workers. Too often in the past companies have found that many accidents have occurred due to these persons who had had "one too many" before reporting to work.

Further, this drinking seems to be more prevalent on the second and third shifts than on the first shift. The condition is no doubt due to the time of day factor. Usually those employees reporting on the first shift do not make a practice of drinking at 6 or 7 am. But those reporting for work at 3 or 4 pm and at 11 or 11:30 pm have plenty of time to hit the high spots in town before reporting and punching in at the plant.

Usually when company rules are established and each employee is notified and instructed, little abuse of this rule is found. Occasionally an employee will overstep and will be sent home by his foreman.

The breath-odor problem presents an entirely different condition. It is certainly not pleasant to have to work beside an employee who reeks of garlic or who has offensive body odors because of careless bathing habits. Yet this becomes something that must be diplomatically handled. It is still a free country and except where the individual's actions affect the company, no action should be taken. This means that what an em-

"I don't know what I'll do if my family gets any bigger!"

There's a MICRO Precision Switch to meet every plant application requirement.

Plant engineers charged with keeping present plant equipment safe, automatic and at high production capacity, find in MICRO precision switches a wide variety of switches to meet their needs.

The MICRO line of precise snap-action switches includes heavy-duty limit switches, explosion proof and splash proof switches, high capacity switches to handle high in-rush currents, sealed plunger switches and small die-cast enclosed switches. All are available with plunger actuators, roller-plunger actuators and with roller-arm actuators. Many have both right- and left-hand mounting arrangements and may be side or bottom mounted.

MICRO SWITCH distributors are located in over a hundred key cities to supply just the right MICRO unit to meet your specific plant application need. Look for them in your classified phone book under "Switches, Electric."

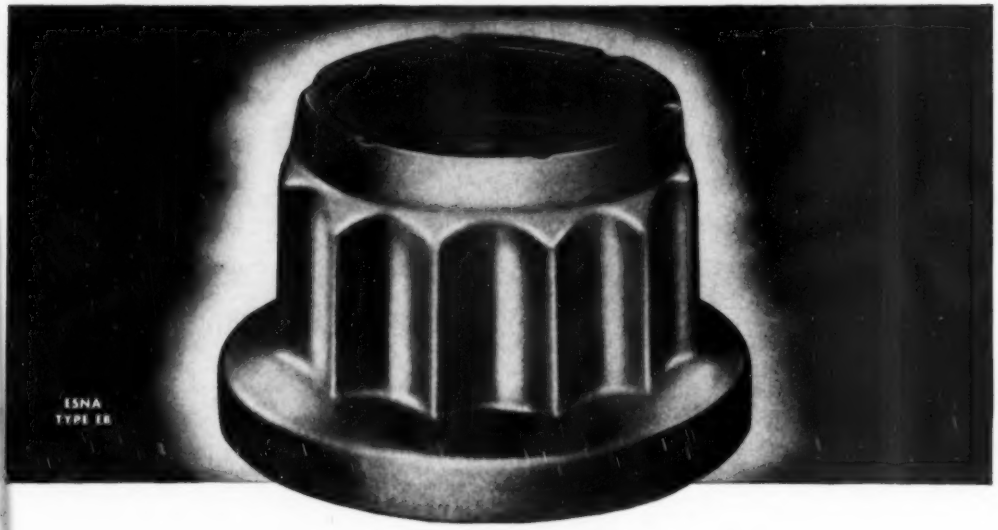
MICRO MS SWITCH

FREEPORT, ILLINOIS

MICRO Snap-Action Switches . . . Honeywell Mercury Switches

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

High Strength DOUBLE HEX NUT CUTS SIZE...WEIGHT OF AIRFRAME COMPONENTS



—the famous Self-Locking Red Elastic Collar

***protects permanently against* IMPACT! VIBRATION!**

The NEW ESNA HIGH Strength-Double Hex Nuts have been scientifically engineered to accomplish distribution of thread load with minimum weight and wrench diameter. They develop 185,000 psi. min. in NAS high strength aircraft bolts, and are completely interchangeable with existing internal wrenching nuts; yet this unique double hex design saves 66% in weight and 50% in height, compared to the old internal wrenching types. These savings in weight and clearance gain greater importance when multiplied by the additional savings in the size and weight of component parts or fittings which the new design makes possible to employ.

Because of their light weight . . . extra safety . . . easy field identification . . . and reduced wrenching area, ESNA Type EB Nuts are accepted as standard for all high tensile applications by airframe manufacturers. Also, of great importance maintenance-wise is the fact that no special wrenches are required—any socket wrench will do.

Further—like all Elastic Stop Nuts—the NEW High Strength Nut remains self-locking in both fully seated and positioned settings.

HERE'S A CHALLENGE: Send us complete details of your toughest bolted trouble spot. We'll supply test nuts—FREE, in experimental quantities. Or, if you want further information, write for literature. Elastic Stop Nut Corporation of America, Dept. N4-39, Union, New Jersey. Representatives and Agents are located in many principal cities.

ESNA

ELASTIC STOP NUTS

HIGH TENSILE

ANCHOR

HIGH TEMPERATURE

SPLINE

CLINCH

GANG CHANNEL

NYLON CAP

NYLON AND FIBER INSERT TYPES ARE QUALIFIED TO SPEC. AN-N-5

ployee chooses to eat or how often he elects to bathe is his right whereas drinking will affect company property and can and should be controlled.

It might be suggested that a little subtle advertising in the company house organ be done regarding bad breath and body cleanliness. Also the new odor-reducing toothpaste and chewing gum may be the answer to many of these offenders. Unfortunately those who are the offenders frequently do not realize that they are. This is a problem that the foreman has to try to solve from all angles. There is, to my knowledge, no easy solution. If the worker is a good operator and is a man or woman worth keeping on the job, the problem is that much more acute. One can not judge a man's work by his breath or his body odor, that is certain.

One way to help would be to call in all supervisors and the personnel department and start a campaign against bad breath. Talk it up and spread the word around as to how this failing can reduce production due to the effect on other workers. Put in gum dispensers and shower facilities and thereby do your part as a company to keep the problem under control.

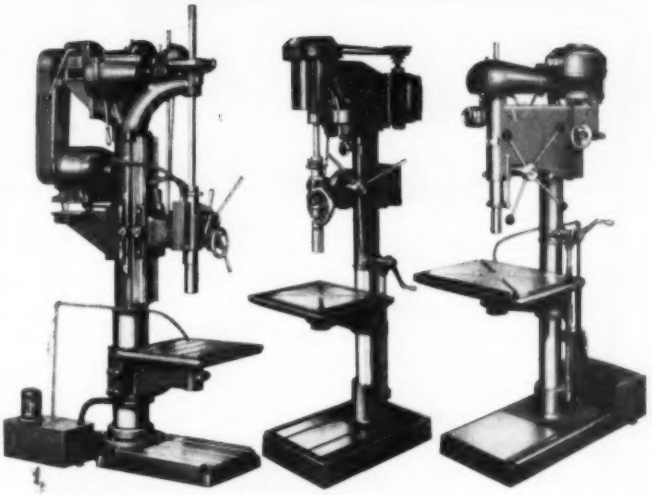
Charles D Townsend
West Hartford, Conn.

NAMES in the NEWS

•

Dr Frank H Driggs has been elected president of Fansteel Metallurgical Corp and its subsidiary, Weiger Weed & Co, succeeding **Robert J Aitchison**, named chairman of the board. **D R Winchester** was named director of the Technical Div, to succeed Dr Driggs. Other appointments include: **Glen Ramsey**, vice president of the corporation; **Herbert B Clark**, president, and **Harry W Highriter**, vice president of Vascoloy-Ramet Corp, a subsidiary.

Bernard F Coggan, former General Motors executive, has been named manager of the San Diego Div, Consolidated Vultee Aircraft Corp, succeeding **K F Leaman**, appointed assistant manager of the guided missile division. **V G Schorlemmer**, formerly secretary and treasurer, has been appointed assistant to A P Fontaine, vice president and general manager. **L W Miller**, vice president, finance, was elected



Models D-24, D-28 available in 24″ and 28″ swing; 1¾″ capacity; 3 speed options; geared power feeds; four speed geared transmission; 25″ head travel; 11″ spindle feed.

Model C-20 has 20″ swing; 1″ capacity in mild steel; eight spindle speeds from 65 to 1360 R.P.M.; geared power feeds; automatic spindle stop; 2 H.P. motor; tachometer.

Model E-25 features large swing of 25″; variable speed drive for drilling ⅛″ to ¾″; 1½ H.P. motor; tachometer shows exact spindle speed; self-locking speed control.

SIBLEY

SIBLEY MACHINE & FOUNDRY CORP.
Dept. AM8, South Bend 23, Indiana
Send Catalog Describing
☐ Model E-25 ☐ Model C-20 ☐ Model D-24
Name _____ Title _____
Company _____
Address _____
City _____ State _____

RE-ORDERS

From Prominent Users of More Than 10 Years Prove the DEPENDABILITY of

JOHNSON METAL CUT-OFF BAND SAWS

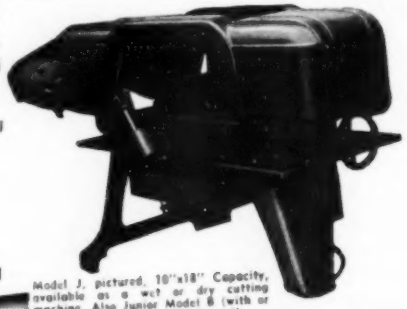
They Buy

AGAIN and AGAIN!

There is nothing more convincing of the excellence of a product than constant re-orders. . . . And that is what Johnson enjoys. . . . Users over a period of years prefer to re-order Johnson Band Saws because they're satisfied; they have confidence in Johnson Saws. They know from past experience that they are getting the best value for their money, the best performance. You, too, should investigate this leading line. Learn about Johnson's high machining standards, close tolerances, speed, accuracy and adaptability.

Write for catalog today.

There is a Dealer Near You



Model J, pictured, 10"x18" Capacity, available as a wet or dry cutting machine. Also Junior Model B (with or without casters), 5"x10" Capacity.

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

acting treasurer; **Edmund Burke**, former assistant secretary and treasurer, was named secretary. **A W Morgan**, former San Diego division factory manager, has been named assistant manager for operations; **J L Fechter**, for administration. **W K Jacks** has been appointed assistant to R H Biron, vice president for industrial relations. **C R Irvine**, former chief engineer for guided missiles, has been named assistant to Engineering Vice President **R C Sebold**; he will be in charge of missile research and development. **H W Pope**, assistant chief engineer, succeeds Mr Irvine. **C D Perrine**, assistant chief engineer for electronics, will also be responsible for missile research and development.

Ivan Speer has been named engineering manager of AiResearch Mfg Co, Phoenix, Ariz. A member of the organization since 1946, Mr. Speer had recently been assistant project engineer at the Los Angeles office; he replaces **Arthur J Phelan**, who returned to Los Angeles as staff engineer.

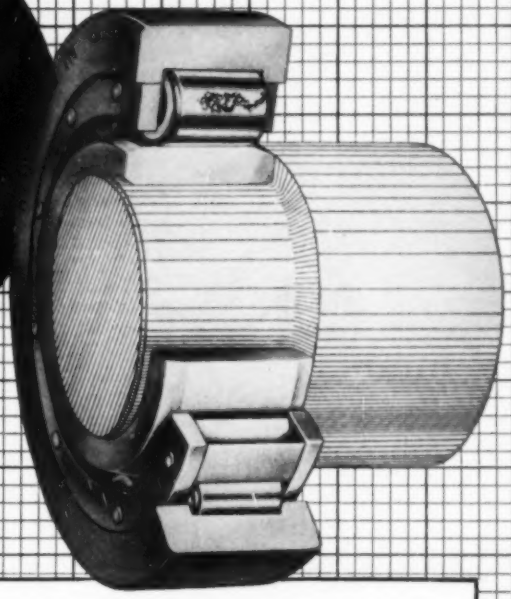
Torbett Crocker has joined the staff of the Rees Machinery Co of Pittsburgh; he was formerly associated with Lobbell United Co.

M Lawrence Price, professor of machine design at Worcester Polytechnic Institute, has joined the Reed Rolled Thread Die Co, Holden, Mass., where he will be engaged in fundamental research. **Joseph S Seville**, formerly chief engineer, has been named supt, and **George W Lyman**, formerly supt, has been appointed chief engineer of the company.

William G Laffer has been made vice president, operations, of the Cleveland Graphite Bronze Co's original equipment division; he has been serving as vice president, manufacturing since 1948. **James H Heroy, Jr**, has been appointed general manager of Pittsburgh Plate Glass Co's brush division, with headquarters at Pittsburgh. Mr. Heroy has been associated with the firm's brush operations since 1946, serving as assistant general manager during the past two years.

M J Merlin has been named Cleveland factory manager. A member of the organization since 1941, Mr Merlin most recently served as manager of the heavywall bearing unit. **Hugh S Highet**, general supt since 1946, has been appointed chief manufacturing consultant.

Heavier Press Fits with HYATT HY-LOADS



THE simplest way to mount bearing inner races is by press fitting. Hyatt Hy-Load Roller Bearings are designed and constructed to permit relatively heavy press or shrink fits of races—fits sufficient to retain races properly without resorting to auxiliary devices such as snap rings, lock nuts or keys.

This is possible because Hyatt Hy-Load races are made from carburizing type steels, carburized and heat treated to provide hard, wear resistant, case-hardened surfaces with tough ductile cores. A hard surfaced race with a ductile core permits heavier press fits than a through hardened race.

The hazards of slippage, cocking or eccentricity, always present with loose fitting races clamped endwise, are avoided when races are properly press fitted.

For more information about this and many other features of Hyatt Hy-Load Roller Bearings, write for Catalog 547. Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

PERFECTION PERSONIFIED . . .
You think in terms of perfection. Your work reflects your thinking. There can be a sureness in the handling of tools that guarantees perfection. Naturally, real mechanics won't compromise on tools—only the finest are good enough.
Bonney wrenches are perfect by rigid standards. That is why mechanics call them America's finest—unmatched for lightness, strength, balance, and precision.
Bonney wrenches are the pride of the men who make them . . . the pride of the men who use them.
BONNEY TOOLS
Perfection in each operation results in the amazing output of America's manufacturers of cars, trucks, buses, and military equipment. Names such as Ford, Chrysler, Hudson, Packard, Nash, Studebaker, identify millions of vehicles that measure up to the master mechanic's standards

HERE'S THE SURE WAY to help your mechanics and machinists make the most of their skill: when you buy wrenches, buy Bonney!

Bonney wrenches have the fit and the "feel" that make for faster, better work, yet they always will be priced competitively with other good tools.

Bonney Tools meet all the rigid standards of perfection of men who take pride in their tools.

BONNEY FORGE & TOOL WORKS
Allentown, Pennsylvania

John E. Cinkosky has been appointed eastern zone manager of the Mercury Clutch Div, Automatic Steel Products, Canton, Ohio. Mr. Cinkosky will supervise the New England, Middle Atlantic, and South Atlantic territories. He was formerly vice president, sales, for Centric Clutch Co, Woodbridge, N. J.

Paul Vinson has been named director of engineering and research for Sheldrick Mfg Co, Upper Sandusky, Ohio. Prior to joining the organization, Mr Vinson was chief design engineer for the Ford Motor Co's Monroe plant. **Bernard E Logsdon,** formerly chief designer, has been appointed assistant chief engineer.

Harold A Hallstein, Jr, has been appointed regional manager of the Nelson Stud Welding Div, Gregory Industries, Inc, with headquarters at the Cleveland branch office. Mr Hallstein joined the firm in 1946; prior to that time he had been associated with Truscon Steel Co.

Paul L Wright has been appointed manager of the Buffalo, N. Y. plant of Joseph T Ryerson & Son, Inc, succeeding **Clarence S Gedney,** retired. Associated with the company since 1939, Mr Wright has been acting as sales manager for the past year.

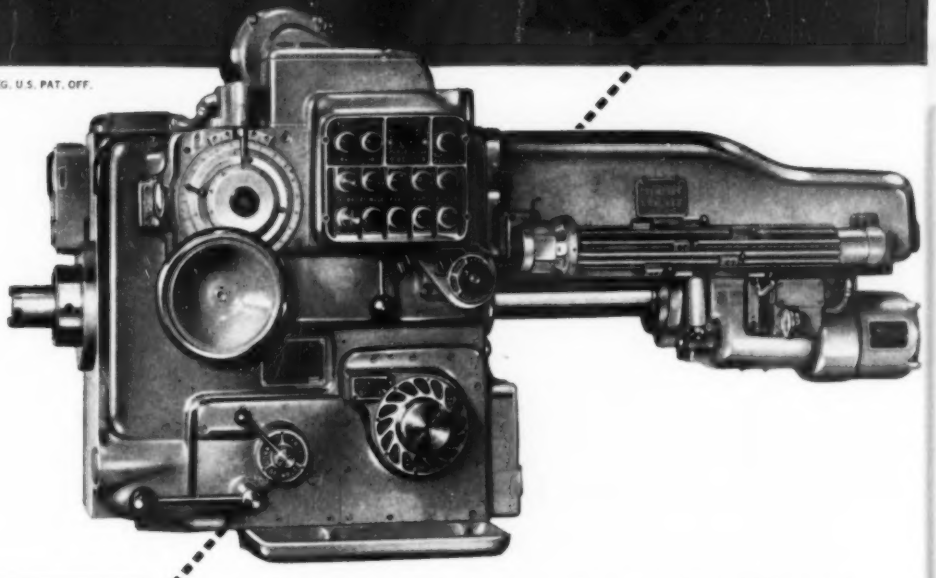
R D Oldfield, Jr, has been appointed sales manager of Ohio Screw Products, Inc, Elyria, Ohio. He had previously been associated with the Johnson Bronze Co of New Castle, Pa.

Frederick B Collins has resigned as vice president and sales manager of Boeing Airplane Co, Seattle, Wash., to become president and general manager of Collins Machinery Corp, newly-organized distributor for Caterpillar tractors in the area. **Ralph L Bell,** who has been serving as assistant sales manager for the past two years, succeeds Mr Collins as head of Boeing's sales organization.

Maurice A Thorne has been appointed engineer in charge of General Motors vehicle development group, previously directed by the late **Louis Thoms. G C R Kuiper,** who has been appointed assistant to Mr Thorne, will work with the car development section of the vehicle development group, and **R V Hutchinson,** also named assistant, will be connected with the automotive ordnance section.

DEVLIEG SPIRAMATIC JIGMIL®

® REG. U.S. PAT. OFF.



TWO SALIENT FEATURES OF THE NEW SPIRAMATIC JIGMILS

1 SPINDLE HEAD with AUTOMATIC TRANSMISSION

All spindle speed changes are made automatically through the operation of a single push button control.

2 AUTOMATIC TRIP MECHANISM for BAR FEED

Spindle bar feed is tripped automatically at any predetermined points.

For the latest developments in precision boring equipment . . . consult

DEVLIEG OF DETROIT

Send for Illustrated Catalog

DEVLIEG MACHINE COMPANY • 450 Fair Ave., Ferndale, Detroit 20, Mich.

SHELDON

CHICAGO U. S. A.

Tool Room Lathes

Precision Built *for* Precision Work

Each SHELDON Lathe is a precision machine tool that in final inspection has passed the 19 accuracy checks on the SHELDON "Inspection Test Sheet".

Produced by modern methods with the finest special machines, these 10", 11" and 12" (swings 13") lathes are quality built on a quantity production basis. Selling at quantity production prices they are today's best lathe values.

Write for Catalog with Test Sheet

SHELDON MACHINE CO., INC.

4234 North Knox Ave., Chicago 41, Illinois

George J Earl has been appointed commissioner of the National Metal Trades Association. Formerly associate commissioner, Mr Earl succeeds **Homer D Sayre** who recently retired from the post.

Eugene E Durst has been appointed to the newly-created post of technical assistant to the manufacturing vice president, Wico Electric Co, Springfield, Mass. Mr Durst has been in charge of manufacturing engineering functions for the company for the past eight years. **Vincent Bagnall,** formerly head of the methods dept, suceeds Mr Durst.

George C Ford has been appointed vice president in charge of manufacturing of Norris-Thermador Corp, Los Angeles; he had previously been general manager of the Norris-Thermador Riverbank plant. Prior to joining the organization last year, Mr Ford was vice president in charge of manufacturing for Joyce, Inc, Pasadena, and president of subsidiary companies.

Robert Shannon has been named manager of the Hastings, Mich., Div of E. W. Bliss Co. Associated with the division for many years, Mr. Shannon has most recently been serving as assistant plant manager. He succeeds **J. H. Tredinnick,** appointed executive vice president of the company, with headquarters at Canton, Ohio.

July and August Are Polio Months

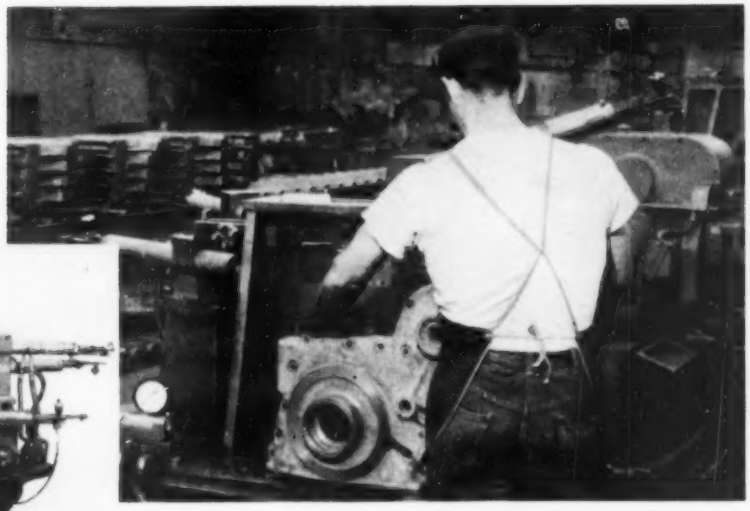
Wash hands carefully before eating

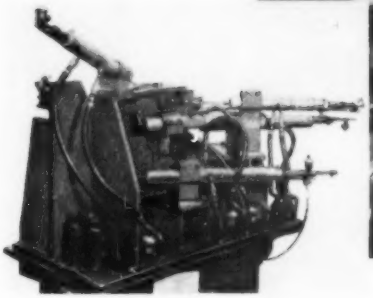
Don't get overtired or chilled; both lower resistance to polio

Avoid mingling with strangers, especially in crowds

Watch for these symptoms: headache, sore throat, fever, upset stomach, stiff neck or both. If they appear, call your doctor

Polio is the only epidemic disease still on the increase in the United States; it has tripled its attack rate since 1948. You can get a copy of the 1952 "Polio Pledge" containing a fuller statement of precautions by addressing The National Foundation for Infantile Paralysis at 120 Broadway, New York 5, N. Y.





THESE FIVE HOLES ARE DRILLED SIMULTANEOUSLY BY AIRFEEDRILLS ON THE ABOVE DRILL FIXTURE:

Diameter	Angle	Depth
¼"	25°	3 ⅛"
¼"	35°30'	3 ½"
¼"	42°	2 ½"
3/16"	compound	⅞"
3/16"	17°	1 ⅛"

Where $1,095 saved $15,000 and avoided rearranging the machine line...

The tool engineer for a farm equipment manufacturer faced the task of drilling five odd-angle holes in timing gear housings. After investigating the various means by which the job could be set up on a production line basis, he fabricated a drill fixture, costing $1,095, on which he mounted five Keller Airfeedrills as shown above. With this equipment, one workman drills all five holes simultaneously by pressing a single control valve. The drills advance, drill, retract, and stop automatically after each hole is drilled to the desired angle and depth.

If a hole angle needs to be changed, it is necessary merely to change the bracket on the drill fixture that holds the drill, and another that holds the drill bushing. Adjustment of hole depth is provided on each Airfeedrill unit. If the Airfeedrills are needed for use on another fixture, they can be detached in a matter of seconds.

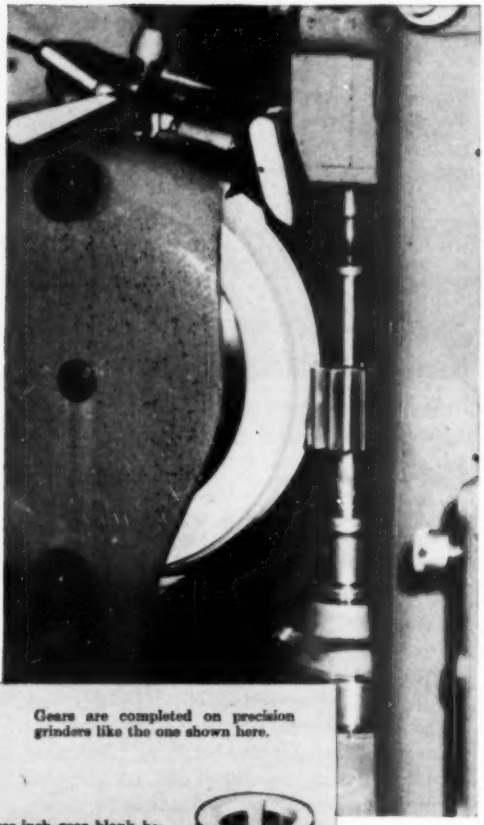
Alternate equipment to handle the same job would have cost about $15,000 and required rearrangement of the machine line. The small space required for the Airfeedrill setup (15 sq ft floor area) avoided this additional expense.

Perhaps you, too, can help speed production, minimize investment, and reduce idle time of your equipment by using Keller Airfeedrills.

KELLER
Pneumatic Tools

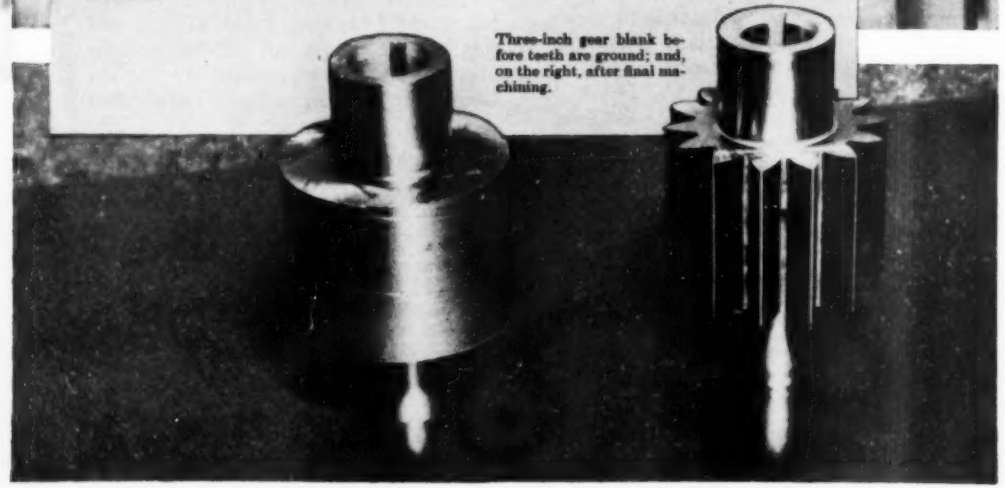
KELLER TOOL COMPANY, GRAND HAVEN, MICH.

"Lean Carilloy



At Commercial Shearing and Stamping Company, gears are machined directly from bar stock. Since the change from rich to lean alloy steel, the need for normalizing and straightening the metal before machining has been eliminated.

Gears are completed on precision grinders like the one shown here.

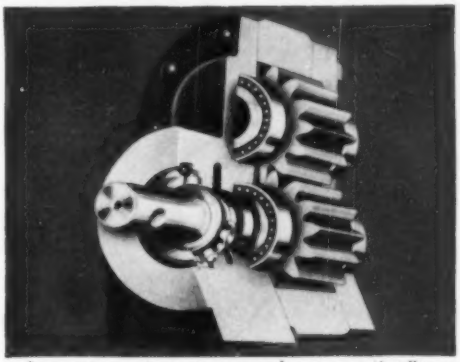


Three-inch gear blank before teeth are ground; and, on the right, after final machining.

alloy steel is saving us $40 a ton ...with no loss in performance."

—T. C. Kane, Chief Engineer

Commercial Shearing and Stamping Co.



In gear-type rotary pumps, speeds are exceptionally high—up to 2000 rpm; and pumps operate at pressures as high as 1500 psi. At Commercial Shearing and Stamping Company, gears for this severe service are now made of straight-chrome instead of nickel-molybdenum steel.

LIKE MANY other manufacturers who, today, cannot get rich alloy steel, Commercial Shearing and Stamping Company of Youngstown, Ohio, has found that many parts that must operate in extremely tough service can be made of *lean* alloy steels with no loss in performance.

Commercial Shearing makes a wide variety of steel products, including stampings and forgings; but it is in their gear-type rotary hydraulic pumps that they must do without rich alloy steel. Choosing a satisfactory alternate steel for the precision gears in these pumps presented quite a problem.

Mr. T. C. Kane, Chief Engineer at Commercial, tells the story this way: "We used to make the gears for our heavy-duty hydraulic pumps out of Carilloy 4615 (a Ni-Mo steel, with 1.65-2.00% nickel). But when nickel started getting scarce, we had to find a steel in better supply that would stand up in this severe service.

"Our gear-type rotary pumps are used in heavy-duty hydraulically-operated mobile equipment and must deliver a constant supply of oil at the correct pressure. In these pumps, oil is trapped between the teeth of two meshing gears and forced through the pump as the gears rotate. To obtain the high efficiencies necessary, gear dimensions must be held within extremely close tolerances. And wear must be held down, because a loss of just 0.005 inch causes a substantial drop in pump efficiency. These pumps operate at pressures as high as 1500 psi and speeds up to 2000 rpm; so we have to be sure to use a tough, wear-resistant steel for the gears. The question was, how to get this in a lean alloy steel.

"One of United States Steel's service metallurgists helped us out. After analyzing our requirements, he suggested a straight-chrome alloy steel—Carilloy 5120. Now that we have lived with this steel for a while, we are frankly surprised at the excellent results we are getting. Not only are our pumps as good as ever, but this straight-chrome steel has important advantages for us over the richer alloy:

"First of all, Carilloy 5120 is easier to machine, so naturally our tools last longer.

"Our heat treating problems are easier, too. Carilloy 4615 had to be normalized and straightened before machining. This is no longer necessary since there is less distortion in carburizing operation.

"With reduced heat-treating costs and a lower grade extra, the change to lean alloy steel is saving us $40 on each ton of steel we buy."

★ ★ ★

The switch from rich to lean alloys is not always as easy as it was at Commercial Shearing and Stamping Company. You may require special heat treating, or simply more *careful* heat treating, to obtain desired mechanical properties. But whatever your steel problems, our metallurgists will be glad to help you with them. Just call the nearest District Sales Office or write to United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

U·S·S Carilloy Steels

USS

UNITED STATES STEEL COMPANY, PITTSBURGH • COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

2-1250

UNITED STATES STEEL

UNBRAKO CAP SCREW HEAD AND THREADS ARE STRONG

Controlled fillet and unbroken flow lines, following the contour of head and threads, eliminate the straight planes of weakness along which shear can occur. Consistently high tensile and fatigue strength, non-slip internal wrenching and fast, easy assembly with the knurled head are other UNBRAKO features that save time and money. Write us for your copy of UNBRAKO *Standards*. STANDARD PRESSED STEEL CO., Jenkintown 1, Pennsylvania.

Standard sizes, #4 to 1", are available from distributors' stocks.

SPS JENKINTOWN, PENNSYLVANIA

UNBRAKO SOCKET SCREW DIVISION CAP SCREWS • SET SCREWS • SHOULDER SCREWS • DOWEL PINS • PRESSURE PLUGS

AT E. C. ATKINS & CO.

A Lindberg Induction Heating Unit brazes carbide tips on circular saws

E. C. Atkins & Co., Indianapolis, Indiana, manufacturer of saws has joined the long list of companies using Lindberg Induction Heating Equipment. Atkins uses a 5 KW unit plus a specially designed fixture to braze carbide tips on large circular saws.

This unit as well as many other Lindberg units in all sections of the country are piling up good production records . . because they are ruggedly engineered and built to minimize irritating breakdowns and expensive work stoppages.

These construction features tell an important part of the story:

Conditioned cooling . . Temperature controlled water cooling eliminates condensation on high voltage parts.

Checklites . . A system of indicating lamps instantly reveals any abnormal operating conditions . . simplifies servicing.

Work coil burn-out protection . . An electrical interlock system makes it impossible to turn on power when cooling water is not flowing.

Long-life industrial tubes feature shortened internal structure . . Kovar metal-to-glass seals . . heavy walled anodes.

Sealed tank capacitors are hermetically sealed against dirt and dust . . require no servicing or refilling.

For your production brazing, soldering, hardening, annealing, stress relieving, hot forming, forging or shrink fitting requirements, investigate Lindberg Induction Heating Units. Ask for Bulletin 1440.

LINDBERG

HIGH FREQUENCY DIVISION
LINDBERG ENGINEERING COMPANY,
2444 West Hubbard Street, Chicago 12, Illinois

production begins with

Columbus Die-Tool

It takes the right machinery to build your product right! Columbus Die-Tool individually designs and builds tools, dies, and special machinery to produce your product alone. This gives you the advantages of lower operating cost, greater production and a higher quality product.

Let Columbus Die-Tool's more than 46 years of designing and engineering experience go to work for you. Contact CDT today about your special die, tool and machinery requirements.

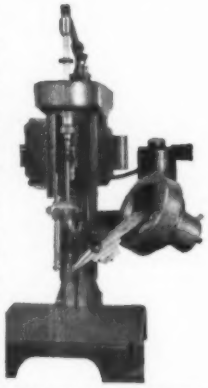
Columbus Die-Tool
AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

What's Wrong With This Picture?

THAT'S EASY There's NO

DETROIT POWER SCREWDRIVER!



• Now—more than ever—speed in production is the order of the day—and D. P. S. Power Screwdrivers provide a wonderful contribution to present-day industrial needs . . . They are a "must" wherever the program calls for production assembling . . . They afford a tremendous gain over obsolete, slow hand methods. Detroit Power Screwdrivers will drive screws—any kind of screws—as fast as one a second.

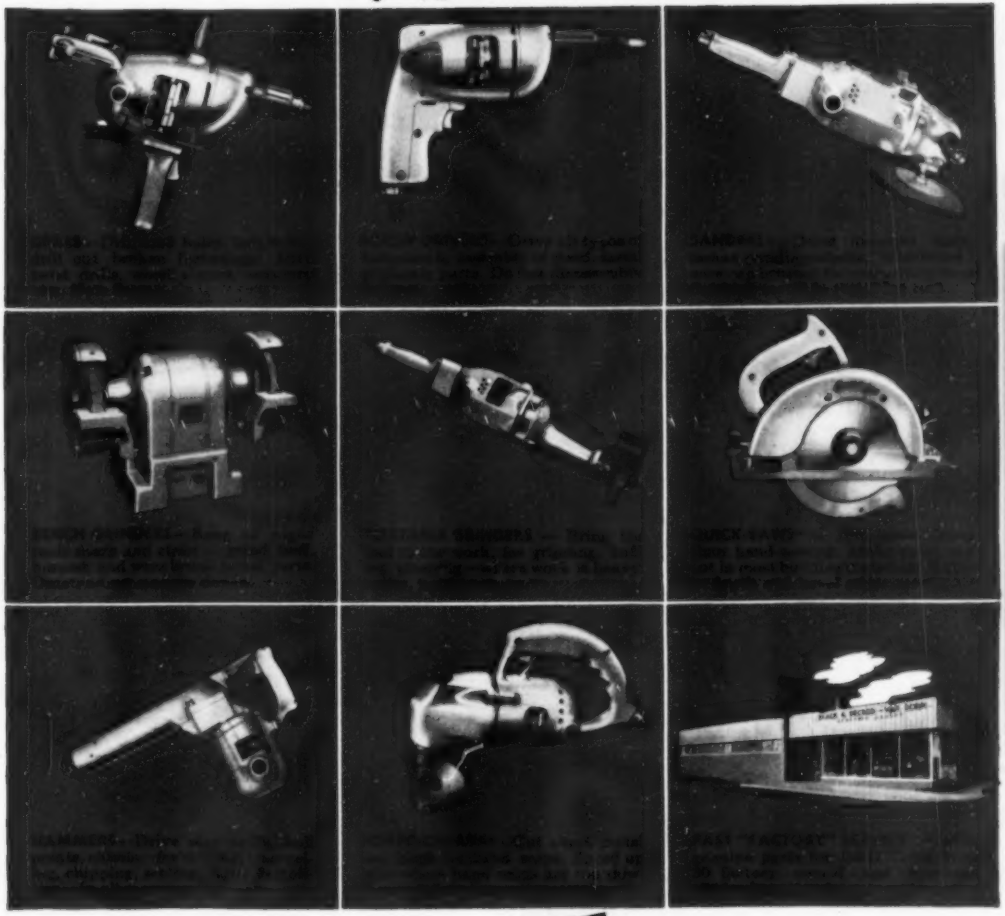
• Get our Catalog NOW, describing POWER SCREWDRIVERS, MOTORIZED HOPPER UNITS, NUT DRIVERS and SPECIAL ASSEMBLING MACHINES. Write today. Also send sample assembly for production estimate.

DETROIT POWER SCREWDRIVER CO.
2797 W. FORT ST. DETROIT 16, MICHIGAN

FASTER TOOLS

for Production, Maintenance, Construction

by Black & Decker



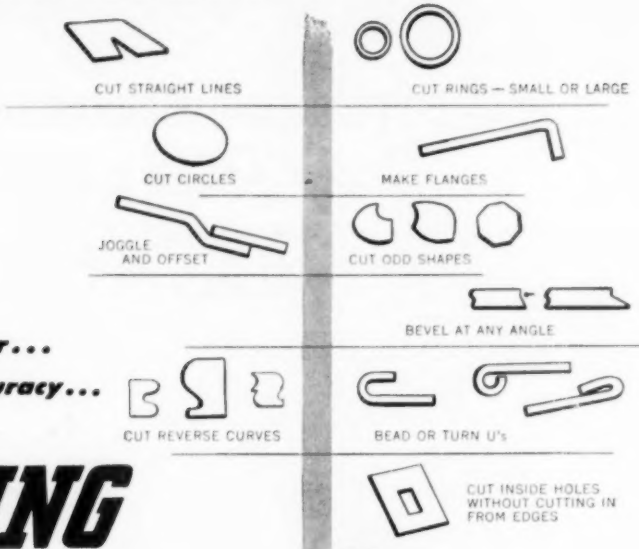
You name the job and there's a Black & Decker Tool to help you do it better, faster, with fewer man-hours, at lower cost! Check the Tools shown on this page—just a sample of more than 100 in the world's most complete line. Then see your nearby Black & Decker Distributor for eye-opening demonstrations—for full details on their easy handling, abundant power, quality construction—for sound advice on any tooling problem. Learn why it pays to "Switch to Black & Decker POWER!"

*Trade Mark Reg. U. S. Pat. Off.

WRITE TODAY for new 1952 B&D Catalog. Gives full details on complete line of tools and accessories. Yours free for the asking! THE BLACK & DECKER MFG. CO., 616 Pennsylvania Ave., Towson 4, Maryland.

BD

if you do One or More of these Jobs...



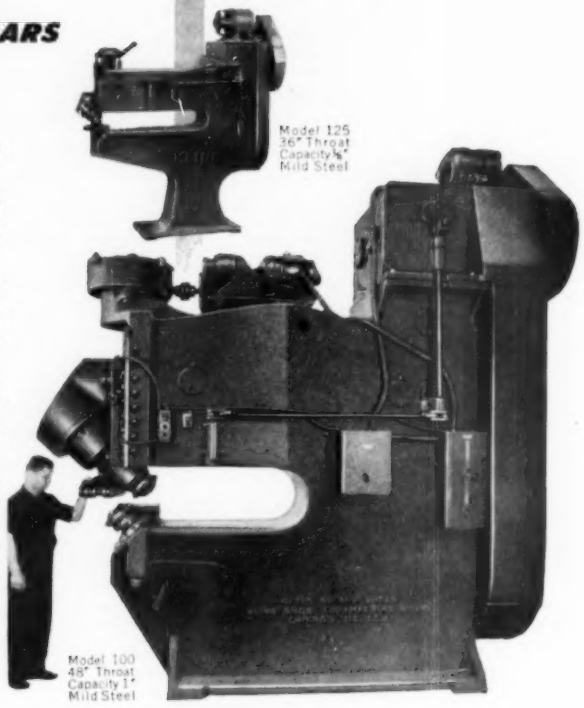
do them faster...

with more accuracy...

at a lower cost...

***with* KLING**

ROTARY SHEARS



Now get hair-line precision as well as speed in all of your sheet and plate cutting. With Kling Rotary Shears, no matter what your shearing requirements, you improve both speed and accuracy. You get accuracy unheard of before in shearing operations. You get speed that will keep pace with today's production demands.

You get this money-saving performance whether you do one or many of the operations shown above. One Kling Shear, because of its versatility, will often eliminate the need of several old style shears or other types of equipment.

Many attachments are available which permit this machine to perform a wide variety of functions. With Kling Shears it is possible to shear almost any shape desired including parts with very small radii, to the right or left.

A wide range of types and sizes are available to meet your specific requirements up to a rated capacity to shear 1" thick mild steel.

get the facts . . . Find out how this machine will fit your production requirements and save you money. For complete details, instructions, features and specifications of all Kling Rotary Shears, write today for your free copy of Kling Bulletin No. 245A.

Kling Bros. Engineering Works,
1318 N. Kostner Avenue, Chicago 51, Illinois

in our 60th Year

Kling

...an investment in speed!

Save with REYNOLDS ALUMINUM Screw Machine Stock

Aluminum screw machine stock from Reynolds offers definite cost reduction advantages over other metals. Thanks to aluminum's light weight, you get three times the number of pieces per pound . . . you cut your handling and shipping costs, too. Aluminum screw machine stock won't rust. And there's a wide range of natural and color anodized finishes that can be used.

For prompt service on aluminum screw machine stock, call your nearby Reynolds office or distributor listed under "Aluminum" in your classified telephone directory. Or write Reynolds Metals Company, 2509 South Third Street, Louisville 1, Kentucky.

SEND FOR THIS VALUABLE HANDBOOK TODAY!

Get your free copy of "Machining Aluminum Alloys" and a complete index of Reynolds literature. Please request on business letterhead (otherwise price is $1.00).

SCREW MACHINE ALLOYS

11S-T3—Free machining. Fine finishes at high speed. Free cutting, fine chips, good strength. Excellent for screw machine work. Longer tool life but slightly less strength than 17S-T4. Good formability of machined parts.

17S-T4—Excellent finishes. Fine for general purpose machining. Good corrosion resistance and strength.

SPECIAL MACHINING ALLOYS

24S-T4—For simple machine work. Chips long and curled. Stronger than preceding alloys. Smooth finishes.

61S-T6—Good corrosion resistance, weldability, strength. Lower machinability. Best formability and suited to electro-chemical finishes.

2S and 52S—Higher purity aluminum alloys available for special applications. Have good formability.

REYNOLDS METALS

REYNOLDS ALUMINUM

SEE NEXT PAGE FOR NAME OF YOUR NEAREST REYNOLDS DISTRIBUTOR

There's a man here you ought to know...

Your nearby Reynolds Aluminum Distributor

Reynolds is putting forth every effort to ease your aluminum-buying problems. To meet the growing demand for this vital metal, Reynolds Metals Company and other U.S. producers are rapidly expanding production. Reynolds alone will have increased production to 829 million pounds by 1953.

To meet your immediate problems the nearby Reynolds distributor is doing his level best to fill orders from present stocks.

You can also count on his assistance and guidance in selecting temporary alternate materials. He will apply all of his experience and energy to help you out. He is a man you ought to know. Now as always he will give you the kind of service you need and want.

YOUR REYNOLDS DISTRIBUTOR IS LISTED BELOW

ALABAMA
Arnold-Brown Metals & Supply Co., Birmingham
Southern States Iron Roofing Co., Birmingham

CALIFORNIA
Clingan & Fortier, Inc., Fresno, San Francisco and Vernon (Ingot also)
Bruce Metals, Inc., Los Angeles
Ivy-Holbrook, Inc., San Francisco
Union Hardware & Metal Co., Los Angeles
United States Steel Supply Div., Los Angeles
Western Metal Supply Company, San Diego

COLORADO
March Steel Corporation, Colorado Springs and Denver
Salt Lake Hardware Co., Grand Junction

CONNECTICUT
American Steel & Alloys Corp., Hartford

DISTRICT OF COLUMBIA
Lyon, Conklin & Co., Inc., Washington

FLORIDA
Baron-Wilson, Inc., Jacksonville, Miami, Orlando and Tampa
Southern States Iron Roofing Co., Jacksonville, Miami and Orlando

GEORGIA
Southern States Iron Roofing Co., Albany, Atlanta, Augusta and Savannah

IDAHO
Salt Lake Hardware Co., Boise

ILLINOIS
J. G. Brown Co., (Architectural only) Chicago
Riverdale & Pinnel Inc., (Ingot only) Chicago
United States Steel Supply Div., Chicago
Benjamin Wolff & Co., Chicago

INDIANA
Hubbell Metals Inc. Indianapolis

KENTUCKY
Southern States Iron Roofing Co., Louisville

LOUISIANA
Southern States Iron Roofing Co., New Orleans

MARYLAND
Clendenin Bros., Inc., Baltimore
Lyon, Conklin & Co., Inc., Baltimore

MASSACHUSETTS
Bay State Refining Co., (Ingot only) Chicopee Falls
Arthur C. Harvey Company, Boston
Pratt & Lambert, (Wire, rod, bar, structural) Worcester

MICHIGAN
Eaton Steel Corporation, Detroit
McDonnell Bros., Inc., (Architectural only) Detroit
Milton A. Meier Co., (Ingot only) Detroit and Grand Rapids

MINNESOTA
Viscose Brass & Copper Co., Minneapolis

MISSOURI
Hubbell Metals Inc., Kansas City and St. Louis
Sheet Steel Corporation, North Kansas City

NEW JERSEY
Edgcomb Steel Corporation, Harrison

NEW YORK
J. G. Brown Co., (Architectural only) New York
Edgcomb Steel Corporation, Palmyra, N. Y.
Rochester Junction & Refining Co., Gasport (Ingot) Rochester

NORTH CAROLINA
Southern States Iron Roofing Co., Raleigh

OHIO
The Allen Metal Co., (Ingot only) Cleveland
O. A. Zoll Roofing Corp., (Ingot only) Cincinnati
The Hanna-Ives Steel Co., Cleveland
Michael Manufacturing & Supply Co., Cincinnati
Ives Brothers, Inc., Cleveland

OKLAHOMA
Viscose Supply Co., Tulsa

OREGON
Woodbury & Company, Coos Bay, Eugene, Medford and Portland

PENNSYLVANIA
Alber Steel Service Co., Philadelphia
Levinson Steel Steel Company, Pittsburgh
Merchant & Evans Co., Philadelphia
Pitts-Farrington Company, Philadelphia

SOUTH CAROLINA
Southern States Iron Roofing Co., Columbia

TENNESSEE
Southern States Iron Roofing Co., Memphis and Nashville

TEXAS
Material-Lewis Mfg. Co., Dallas, Houston, Lubbock, San Antonio and Temple
Viscose Supply Co., Dallas, Denver and Snyder

UTAH
Salt Lake Hardware Co., Salt Lake City

VIRGINIA
Southern States Iron Roofing Co., Richmond

WASHINGTON
Joseph T. Ryerson & Son, Inc., Seattle and Spokane
Clingan & Fortier, Inc., Seattle

WISCONSIN
Benjamin Wolff & Co., Milwaukee

Look Under "Aluminum" in Your Classified Telephone Directory

REYNOLDS METALS

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

It's new Curtis

MODEL 98 AIR COMPRESSOR
Two Stage Air Cooled 15 and 20 Horse Power

designed to give you **even greater dependability**
lower cost operation
longer life

Features that make the number 98 compressor truly outstanding:

1. Two-Cylinder Compressor — less friction and less oil consumption
2. Vibration Free — smooth operation
3. Self Oiling by positive Centro-ring method
4. Timken Main Bearings — provide easy external adjustment
5. Four section Finned Intercooler — effective cooling between stages
6. Valves readily removable as assembled units
7. Precison Built — assures long life and minimum maintenance
8. Experience backed by 98 years of "Know-How"
9. Also furnished in both base and tank mounted units

Sales Representatives:
C. HOMER REDD { 421-423 E. Washington Blvd., Los Angeles 15, Calif. • 2850 Broadway, Oakland 11, Calif.
O. J. THOMAS, 1018 S. E. 8th Ave., Portland 14, Oregon

Mail coupon for additional information

Other CURTIS Equipment that Increases Plant Efficiency—Reduces Production Costs

Vertical Air Hoists for Low Cost Lifting or Lowering of Materials or Machines

Air Cylinders for Almost Any Pushing, Pulling or Hoisting Operation

CURTIS PNEUMATIC MACHINERY DIVISION
of Curtis Manufacturing Company
1924 Kienlen Ave., St. Louis 20, Mo.

I am interested in items checked below:

☐ THE NEW MODEL 98 AIR COMPRESSOR ☐ VERTICAL HOISTS ☐ AIR CYLINDERS

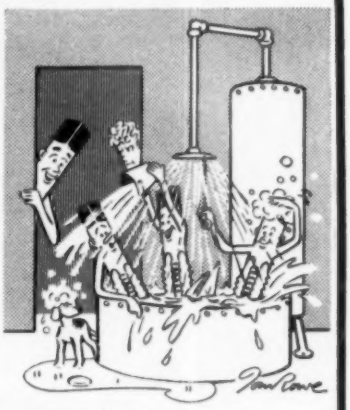
Name.....
Firm.....
Street.....
City..... Zone..... State.....

Other Curtis Compressors available in sizes from ¼ to 50 horsepower inclusive.

CURTIS PNEUMATIC MACHINERY DIVISION of Curtis Manufacturing Company
1924 Kienlen Avenue • St. Louis 20, Missouri

TAP-ODDITIES

A common problem in the home
Faced Production Pete.
How could he get his youngsters
To wash their dirty feet?



But now, the kids all think it's fun.
(What power a genius hath)!
For—You always get a clean-cut job
Each time you "take a Bath"!

It's a fact . . . you men in charge of today's production, have steadily increased your specifications for Bath "ground from the solid" Taps on long runs . . . where clean-cut threads, uniformity and speed are essential. Excessive spoilage soon kills a job profit-wise and you have found the dependability of BATH stock and special taps to be most important . . . because they give you permanent "thread insurance".

The type of metal, tapping machine used and details of the threading job to be done, effect the selection of the right BATH TAP. Whatever your problem, Bath engineers welcome the opportunity to make recommendations or to design custom taps for unusual work.

Base your judgment on performance . . . and you'll buy BATH TAPS for BETTER THREADS.

INSIST ON BATH TAPS
—PROFIT BY THEIR
PLUS—PERFORMANCE

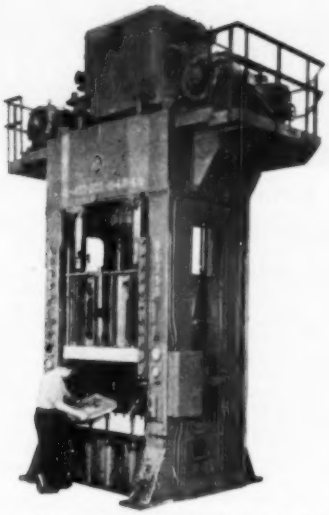
JOHN BATH CO. INC. · WORCESTER · MASS ·

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

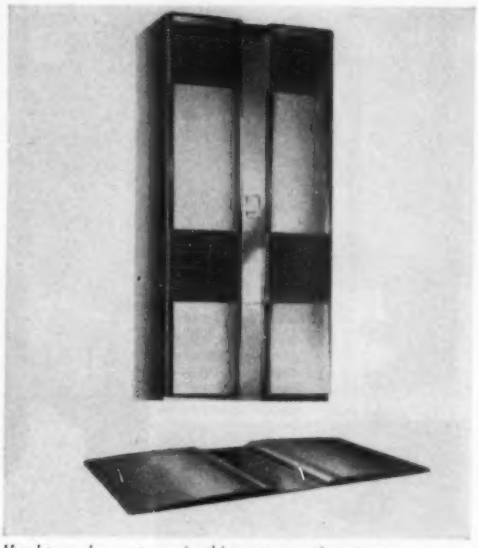
JOHN BATH CO. INCORPORATED

22 Grafton St., Worcester, Mass.

The trend is to more stampings WITH BLISS PRESSES...



1200 14-gauge drip pans are drawn and formed daily in this Bliss press which has a 400-ton blankholder pressure and 200-ton plunger capacity.



Hard-to-make contours in this center-section stamping for a Weathermaker are drawn from 20-gauge steel at the rate of 1800 daily.

Versatile Bliss Hydro-Dynamic Allows Unusual Metal Design

A new 600-ton Bliss double-action Hydro-Dynamic press helps Carrier Corporation produce nice-to-look-at but tough-to-make contours for its line of air conditioners.

Carrier's Vice President of Manufacturing reported that, "By varying ram, blankholder and cushion pressures and the draw cycle, we have been able to complete difficult drawing operations with sharp corners and small radii at the bottom... Actually, the press has exceeded our expectations."

Top performance? Of course—but it's all a matter of picking the proper press. It's what Bliss engineers mean by "the *right* press for the job."

Top panel for window-model Room Air Conditioner has intricate contours, sharp corners and bottom radii. Yet Carrier was able to produce them at the rate of 1200 per eight-hour shift.

E. W. BLISS COMPANY, CANTON, OHIO

E. W. Bliss (England) Ltd., Derby, England

E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo, and Toronto, Canada. **West Coast Representatives:** Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Co., Seattle. **Other dealers** in United States cities and throughout the world.

BLISS ON YOUR PRESS IS MORE THAN A NAME ...IT'S A GUARANTEE!

HOW LAPMASTERS

→ Increase Production
→ Lower Costs and
→ Improve Product Performance---

Lapmaster "24" with 3 conditioning rings and pneumatic lifts. Lapmasters are also available with 12", 36", 48" and 72" lapping plates.

New Method and Machine Design Principle Offers Cost Reductions *PLUS* Consistent Accuracy

Here are three specific examples of how Lapmasters have opened new savings and cost-cutting avenues to manufacturers. Lapmasters are extremely versatile lapping machines. They generate precision flatness and finish in short runs or in high production quantities. In one cycle, Lapmasters can precision-lap either identical parts or parts of dissimilar shapes and materials. In addition, the self-conditioning lap plate, alone, accounts for tremendous cost savings because there is no loss of production time for replacing or re-conditioning. Self-cooling operation eliminates work distortion.

Production Increased From 1000 to 7000 Parts Per Day

Increased production effected by the Lapmaster on these thrust bearing plates is actually over 700%. Parts are $\frac{1}{16}$" in diameter, have a .025" diameter stem, $\frac{1}{8}$" in length. The $\frac{1}{16}$" bearing surface must be lapped flat to within 2 light bands, finish requirement is 3 RMS.

The parts are turned on a screw machine, hardened, and then lapped by the Lapmaster. Eliminating grinding and finishing operations (which are now accomplished by the Lapmaster while lapping) results in this tremendous labor saving.

Finish Grinding Eliminated & 2 Machines Replaced by 1 LAPMASTER

Here's a case where one Lapmaster replaced two conventional lapping machines. This Lapmaster is used to lap seal parts of a wide variety of materials including cast iron, bronze, carbon, ceramics, stellite, etc. Frequently different materials are processed in the same cycle. A big savings of the Lapmaster over previous equipment was the elimination of finish grinding operations previous to lapping.

Leakage Between Mating Joints Eliminated

Production on this Lapmaster is 3000 parts per day. Distortion resulting from grinding had always created leakage through mating joints and consequent high number of rejects. With the installation of the Lapmaster, a complete storeroom of rejects were salvaged, rejects on subsequent parts were completely eliminated and even the finish grinding operation itself was eliminated.

Get All the Facts

Write for this informative 16 page booklet today. Ask for bulletin No. AM 8.

JOHN CRANE

CRANE PACKING COMPANY

LAPMASTER DIVISION

1836 CUYLER AVENUE · CHICAGO 13, ILLINOIS

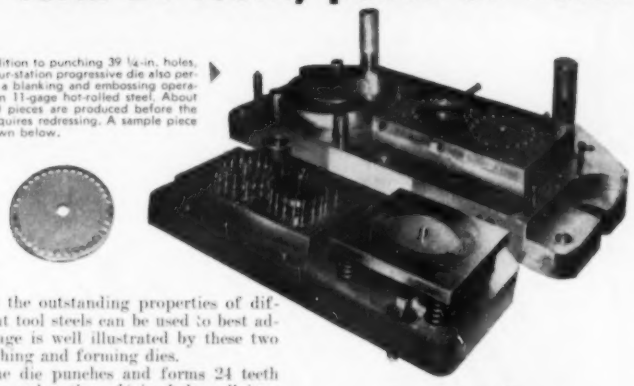
Offices in All Principal Cities in United States and Canada

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

BTR and LEHIGH H team up to form 24 teeth, punch 39 holes

In addition to punching 39 ¼-in. holes, this four-station progressive die also performs a blanking and embossing operation on 11-gage hot-rolled steel. About 25,000 pieces are produced before the die requires redressing. A sample piece is shown below.



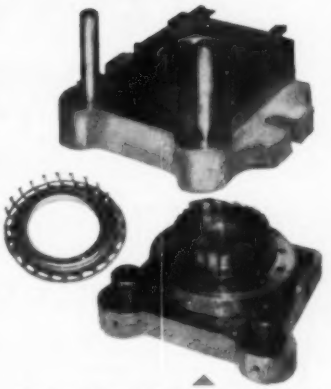
How the outstanding properties of different tool steels can be used to best advantage is well illustrated by these two punching and forming dies.

One die punches and forms 24 teeth and punches three ¼-in. holes, all in a single operation. The other die punches 39 holes of ¼-in. size, blanks out the piece, and embosses it.

The punches of both dies are made of BTR, our manganese-chromium-tungsten oil-hardening steel with a hundred and one uses. It has plenty of wear-resistance, and it takes the shock of the punching operation. BTR is easy to machine and heat-treat. And it's economical.

The die rings for both dies are made of Lehigh H, our general-purpose grade of high-carbon, high-chromium steel. This air-hardening grade is first choice wherever it's essential to have minimum distortion during heat-treatment. In addition, Lehigh H provides long-wearing properties for those long runs. You just can't get a better tool steel when you need accuracy and long wear.

Both these Bethlehem grades are stocked in popular sizes by Bethlehem tool steel distributors in principal cities everywhere, and in our mill depot.



This die punches and forms 24 teeth in 18-gage cold-rolled steel and punches three ¼-in. holes. About 50,000 pieces are produced before redressing.

METALLURGICAL SERVICE — Bethlehem metallurgists are on call whenever you have problems. They'll assist with the selection of tool steel, or its heat-treatment, forging, grinding, machining, design, etc.

Sometimes it takes more than just good tool steel

In a customer's plant the other day we asked the shop boss the name of the tool steel he used for a blanking die which we saw in his shop.

"Sorry, but I just can't tell you. All I know is, it works fine. We used to have a lot of trouble with that die . . . and then one of your Bethlehem men came in here one day. He worked with the die all day, and he cured the trouble for good."

Later we checked with the toolroom and found that the grade used for the die was BTR, our general-purpose, oil-hardening tool steel — and a mighty reliable one, too. The fact that the superintendent didn't know its name was probably a compliment. It was doing a good job. He no longer had to worry about it. So the name didn't matter.

The point is, it takes more than the best tool steel to make some tools and dies work right. Sometimes what counts most is the service that goes with the tool steel — our vast experience in applying each grade, the sales service, metallurgical service, and distributor service.

"Service" is often a glib promise, an intangible sales point. But we at Bethlehem look on service as an inseparable part of our product, something that goes along with every bar of steel we ship.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Special treatment often permits using carbon tool steel

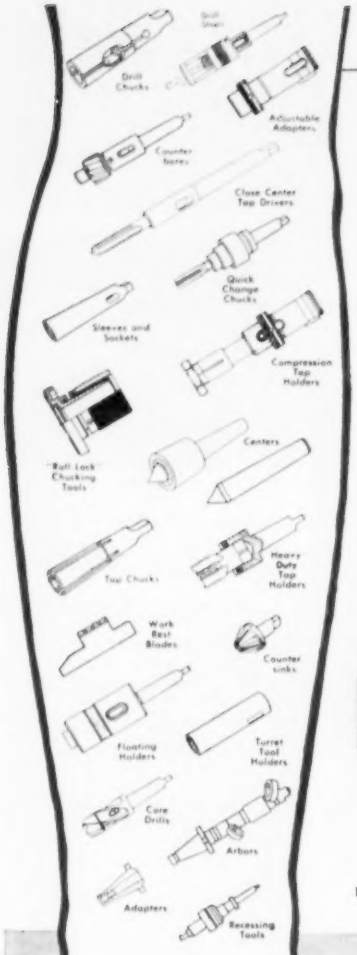
We have run across several customers who use carbon tool steels for tools and dies that others would ordinarily make from oil- or air-hardening tool steels. This is real economy.

The secret in most cases is in the design of the tool. Avoided are: sharp corners, small projections from heavy sections, numerous holes with both thick and thin webs. If the tool can be designed to minimize such hazards, carbon tool steel is often an effective solution.

When there are many holes in a die made from carbon tool steel, a good heat-treater will carefully pack the holes with asbestos or fire clay, then heat carefully and uniformly to obtain a well-hardened die. This precaution reduces distortion during heat-treatment and avoids causing cracks in quenching.

HEAT AND TEMPER COLORS SHOWN ON HANDY CHART

Want to estimate the temperatures of heated steel? Our convenient color chart is printed in natural tones; heat colors are accurately reproduced on one side and temper colors on the other. Write for your free copy to Publications Dept., Room 1042, Bethlehem, Pa.



speed up retooling

by using SCULLY-JONES STANDARD

SLEEVES, SOCKETS and TURRET TOOL HOLDERS

Keep your machine tools working, without interruption, for a fraction of special tooling costs. These *standard* tools quickly convert machine spindles for various tooling requirements, permitting use of cutting tools you have on hand. They are heat-treated to resist nicking and burring, and precision-built to help get fast, accurate production at low cost.

1 Plain Drill Sleeves, Style 100-D, with Morse Tapers.

2 "Use-'Em-Up" Sleeves, Style 100, with Morse Tapers—The FLAT furnishes a positive drive.

3 Extension Sockets, Style 100-W, with Morse Tapers—Three series: short, medium and long.

4 Square Hole Sockets, Style 100-H—A strong square drive for stayholt setters, flue expanders, taps, reamers, and for tools to be dropped through the work.

5 Milling Machine Sleeves, with B & S Tapers—Style 1 with Tang and Style 2 with threaded hole for draw-in rod.

6 Turret Tool Holders, with Morse Taper holes—(a) Short, (b) Sleeve and (c) Extension Types.

7 Turret Tool Holders, with STUB Taper holes—Sleeve Type for holding counterbore cutters, countersinks, core drill cutters and similar tools with standard Stub Taper shanks.

Scully-Jones AND COMPANY

1902 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

WRITE FOR BULLETIN No. 7-50
Shows complete information on S-J Sleeves, Sockets and Turret Tool Holders.

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

the "ARMS and HANDS" for your MACHINE TOOLS

If you think of a Lathe, Mill, Multi-Spindle Machine, or other Machine Tools as being a human body, supplying power to the parts of the body doing the actual work, then Scully-Jones tools represent the "Arms and Hands"

LET YOUR PROBLEMS BE OUR PROBLEMS

Helping you solve your tooling and production problems is Scully-Jones first objective. Ever since 1912 we have designed, developed and manufactured tools to the highest standards to help you get fast, accurate production at low cost.

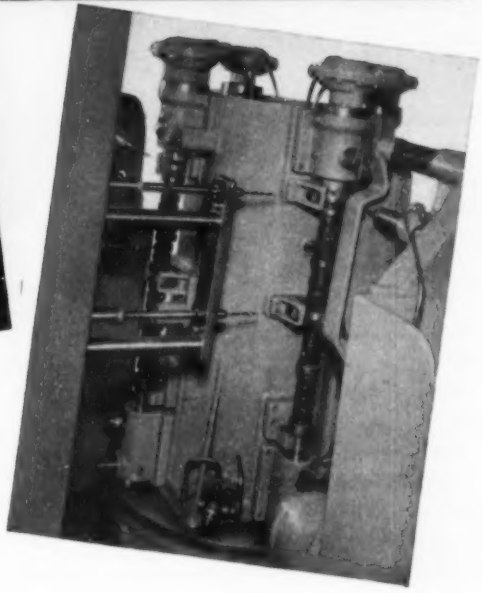
That is why you can purchase S-J Tools and get the best that engineering research, modern equipment, correct materials and expert workmanship can produce.

Use these S-J "Arms and Hands" to equip your machine tools. They will help you get low cost, fast, accurate production on such operations as drilling, reaming, tapping, milling, counterboring, countersinking, core drilling, recessing or undercutting, boring and grinding.

For current information on S-J Tools, refer to Catalog 600. Write on your company letterhead for your copy.

Let us help you solve your tooling and production problems. Because our manufacturing facilities have been expanded, we're in a position to give you reasonable deliveries. For quick service see our nearest representative or contact Scully-Jones direct.

two machines with a single purpose ...PRODUCTION



Above, four automotive connecting rods have both sides of crankshaft bore chamfered simultaneously. At right is shown one machine drilling four oil holes for camshaft journals and milling keyway for timing gear on automotive camshaft. Both machines illustrated utilize automatic clamping.

When it comes to production —

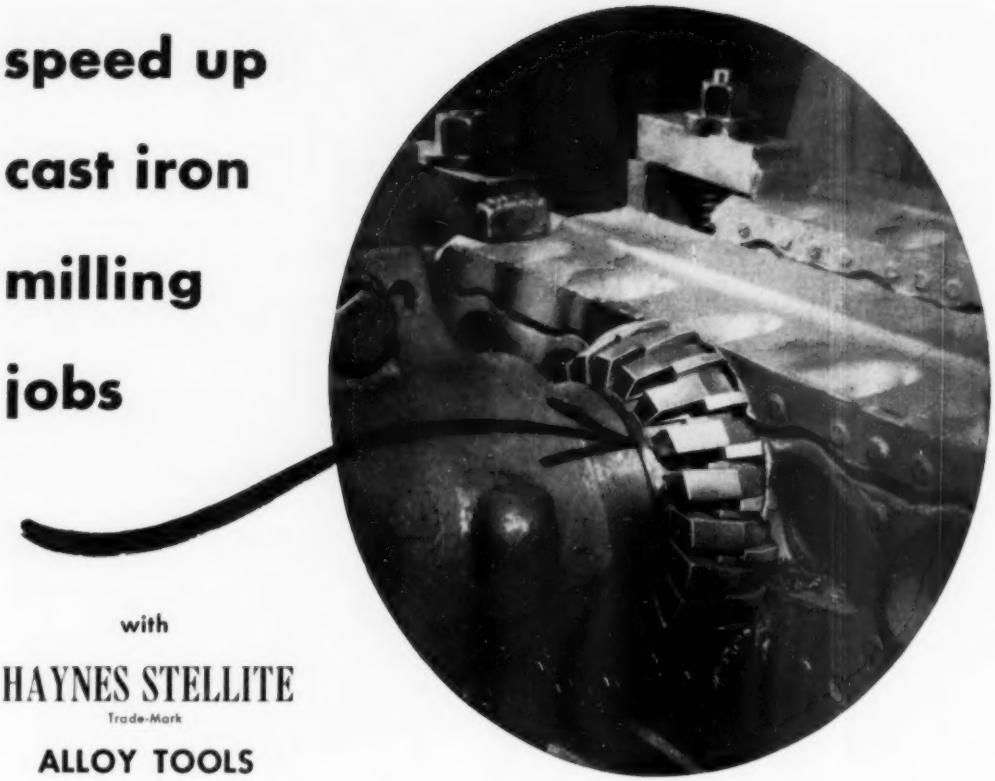
HARTFORD *Special*

SUPER-SPACERS

Automatic THREAD ROLLERS

THE HARTFORD SPECIAL MACHINERY CO., HARTFORD 12, CONN.

speed up cast iron milling jobs



with

HAYNES STELLITE
Trade-Mark

ALLOY TOOLS

High compressive strength at cutting temperatures . . . good impact strength . . . and extremely low frictional coefficients make HAYNES STELLITE alloys ideal tool materials for cast iron milling jobs.

Two hard grades of HAYNES STELLITE alloy are available for milling cast iron at high speeds. On soft cast iron (less than 185 Brinell), these tools can take light milling cuts at speeds up to 300 surface ft. per min. For heavy milling, speeds up to 250 surface ft. per min. can be used.

Hard cast iron up to 240 Brinell can be milled at speeds as high as 200 surface ft. per minute. Safe chip loads range up to 0.025 in. per tooth.

Tougher grades of HAYNES STELLITE alloy are available for efficient milling of castings that have irregular contours, surface imperfections, or inclusions, or where there are variations in chill depth.

HAYNES STELLITE alloy tools are available as fabricated shell-end mills and as insert milling-cutter blades. The different grades of alloy can be used for a wide variety of milling conditions. If you wish help on your own particular milling problems, write to the nearest Haynes Stellite Company office.

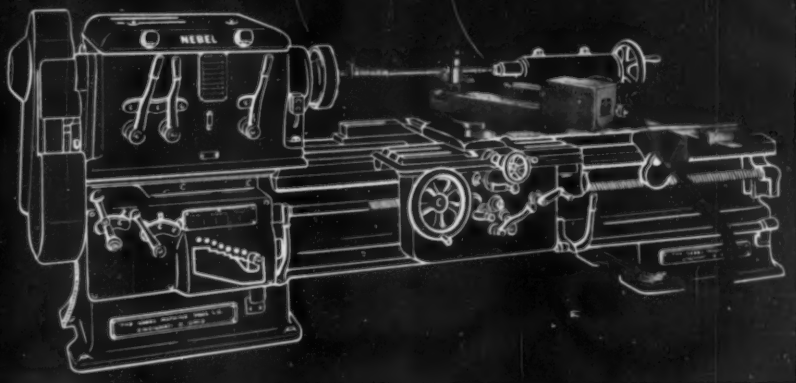
For a copy of the new manual, "HAYNES STELLITE Metal-Cutting Tools," write to our General Offices.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

the first complete, low-cost hydraulic duplicator



Nebel *duplicating attachment*

made for all Nebel lathes by The Walker Hydraulic Duplicator Co.

NEBEL DUPLICATOR BRINGS YOU:

- Newest design
- Greater accuracy
- Lower initial cost
- Higher production rates

THE NEBEL DUPLICATOR

- Can be installed on Nebel lathes in the field
- Can be purchased for new Nebel lathes
- Can be taken on and off easily, quickly
- Uses inexpensive flat templates

HERE'S A BRAND NEW hydraulic duplicating attachment made especially for Nebel customers past, present and future. If you already have a Nebel lathe, you can buy a Nebel duplicating attachment and install it yourself in a matter of minutes. If you don't own a Nebel lathe yet need the benefit of low cost, high production automatic sizing, then you can buy a complete Nebel duplicating lathe . . . at a fraction of the cost of competitive duplicating lathes.

HERE AT LAST is a duplicating attachment that produces repetitive work accurately, quickly, dependably, and at lowest cost. It will pay you to investigate the Nebel duplicator today. For complete information by return mail, use coupon below.

THE NEBEL MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.

We're interested in the new Nebel duplicating attachment.

☐ *Please send complete information.* ☐ *Have Nebel representative call on us.*

NAME _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

Filling the Breach

at 250 Rounds Per Hour

IT BANDS UNIFORMLY

W-S SEMI-AUTOMATIC SHELL BANDING PRESS

For Conventional Bands or Powdered Metals

Here's a machine that's setting new daily production records right at the shell banding station . . . with rates up to *250 per hour* on 90, 105, 120, and 155 MM ordnance.

With exception of the loading operation, control is entirely automatic. Pressing the "cycle-start" button causes twenty-four synchronized rams to move in radially upon the shell, exert preset pressure, and dwell for an automatically timed period. Another push-button operates the automatic air-ejector.

Where unit work pieces are large and heavy, this kind of mechanized operation and handling pays off in increased man-hour productivity even over extended work periods. The proven design provides the maximum in trouble-free availability and low maintenance . . . You get less rejects. Capacity 500 Tons . . . overall height 3 ft. . . . floor space required 8' 6" x 6' 0".

Write for complete details of this latest revolutionary development in our national preparedness machine.

WATSON-STILLMAN
ESTABLISHED 1848

HYDRAULIC MACHINERY DIVISION

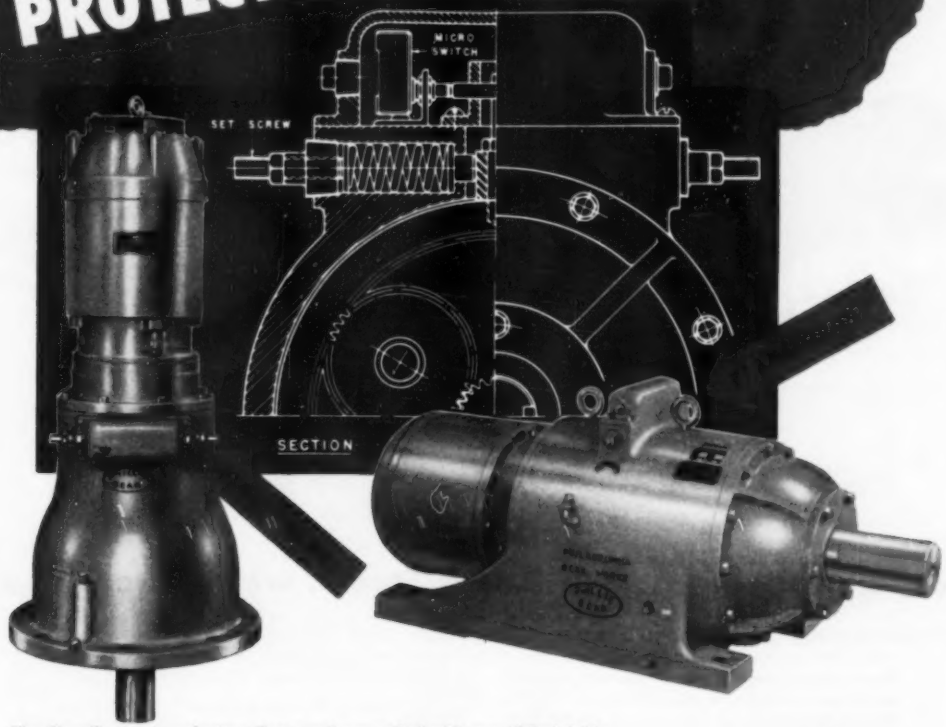
Factory and Main Office:
163 Aldene Rd., Roselle, N. J.

W-S Completeline

Branch Off.: 228 N. LaSalle, Chicago Ill. • Manufactured in Canada by Canadian-Vickers, Ltd., Montreal

HYDRAULICS . . . THE SHORTEST DISTANCE FROM PRODUCTION TO PROFIT

Instant PROTECTION Against overload



The PlaneTorque is a feature that can be supplied with any Philadelphia MotoReduceR* *(combined motor and speed reducer)* or Philadelphia Planetary Reducer to protect both the driven machinery and the drive unit from dangerous overloads.

By direct mechanical action of the overload, motor current is *automatically and instantly cut off* when a pre-determined limit is reached. This action is quicker than electrical thermal relays provide. (With fuse protection only, fuses must be selected to carry the starting current of the motor; therefore, protection during running period is *not adequate*.)

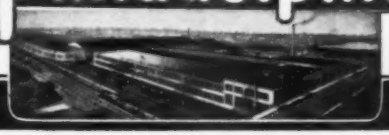
The PlaneTorque can be cut-out during the starting period by merely holding down the starting button, but will become operative during running period when button is released. To re-start the PlaneTorque MotoReduceR after overload cut-off, *only removal of excessive load is necessary . . . a big time-saving feature.*

For applications such as stoker drives, conveyor drives, mixers, agitators, roll drives, tumblers etc. . . . investigate the PlaneTorque MotoReduceR.

Send for Catalog MR-49

* Reg. U.S. Pat. Off.

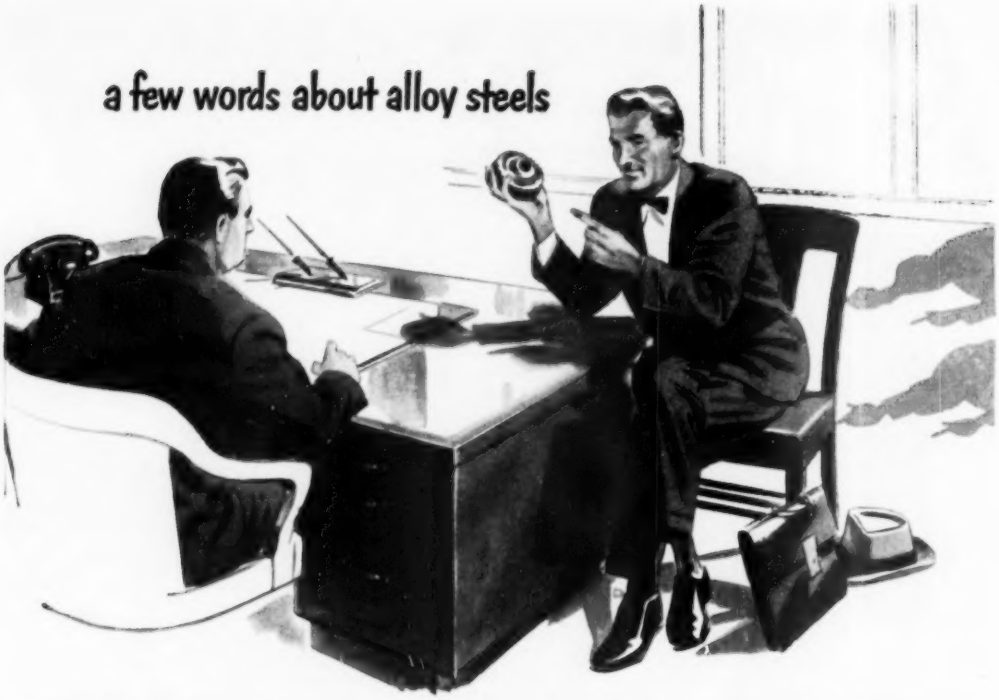
Philadelphia Gear Works, INC.



ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

a few words about alloy steels



or, where you can use Boron Steels, *we can help you*

If you are faced with the problems of allocations and shortages of the alloy steels you've been accustomed to use, you can probably make your job easier by shifting to Republic alternate grades or *boron* type alloy steels.

Republic has been producing boron steels commercially for more than 10 years. In that time we have made more tons of boron steels than any other alloy producer. Which means that we have solved more problems of shifting to boron alloys, have assembled more knowledge about the boron grades than any other producer.

Our 3-Dimension Metallurgical Service can give you the help you need to switch your production to alternate alloys or boron steels quickly and with the fewest headaches. A Republic Field Metallurgist analyzes your products and production set-up right in your plant. Then he goes over your case with the other two members of the 3-Dimension team... the Republic Mill and Laboratory Metallurgists.

The result? If the parts you are making from alloy steels are adaptable to *boron* steels, you'll get expert answers and recommendations that will speed you into boron-grade production promptly.

Boron steels aren't always the answer, may not solve every problem . . . your Republic Field Metallurgist will give you honest advice, backed by Republic 3-Dimension Metallurgical Service.

When may we call?

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N.Y.

LAB FIELD MILL
3-DIMENSION Metallurgical Service

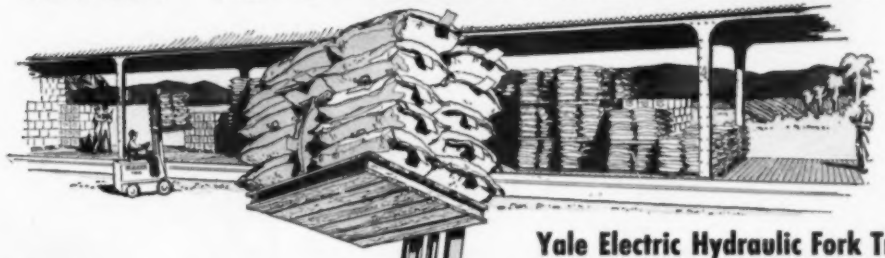
REPUBLIC STEEL

Republic ALLOY STEELS

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

Report to Management from Yale Materials Handling Headquarters:

Important California Industry saves $196,000 yearly with Yale Electric Trucks



WHATEVER YOUR BUSINESS . . . textiles, tool-making, food processing or steel . . . you must move materials from one point to another. And whether your labor force is measured in tens or in thousands . . . efficient, economical handling of materials is today more important than ever . . . *and often means the difference between profit and loss.*

Yale Materials Handling Equipment is chalking up savings of from 50 to 75% in many businesses that never realized how costly their former handling methods were. You can count on Yale, the leading manufacturer of materials handling equipment, to give expert attention to your specific handling needs. Mail coupon for booklet.

Yale Electric Hydraulic Fork Trucks Brought These Benefits To California Walnut Growers Assoc.

1. **SAVINGS IN MONEY.** Yale Equipment cut the cost of handling from $.05 to $.004 per bag. Reduced overall handling expenses $196,000 a year.

2. **SAVINGS IN MANPOWER.** Change from hand truck methods to mechanized Yale equipment released 9 out of 10 men from handling . . . made them available for other more productive work.

3. **SAVINGS IN TIME.** Yale Equipment sped processing, storage and shipping operations, ended bottlenecks . . . offered many time-saving short-cuts essential with a highly seasonal product.

YALE

MATERIALS HANDLING EQUIPMENT

YALE is a registered trade mark of The Yale & Towne Manufacturing Co.

MAIL THIS COUPON TODAY

The Yale & Towne Manufacturing Co., Dept. 188
Roosevelt Blvd. & Haldeman Ave., Phila. 15, Pa.

I want to know how Yale Materials Handling Equipment can help me.

☐ Please have your local Representative call.

☐ Please send free copy of THE PICTURE STORY OF YALE MATERIALS HANDLING EQUIPMENT.

Company_____

Name_____ Title_____

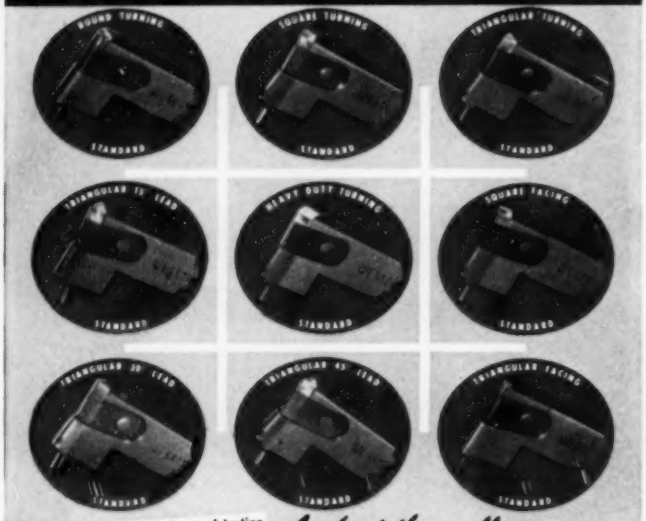
Street_____ City_____ State_____

In Canada write: The Yale & Towne Mfg. Co., St. Catharines, Ont.

YALE GAS AND ELECTRIC INDUSTRIAL TRUCKS • YALE WORKSAVERS • YALE HAND TRUCKS • YALE HAND AND ELECTRIC HOISTS • YALE PUL-LIFTS

WESSON'S

9 • 90
STANDARD TYPES · STANDARD SIZES



Two years research and actual testing on tough, high-production jobs

Look at these all-new, cost-cutting Features!

Guaranteed to OUT-LAST, OUT-PERFORM any other tool holder. Indestructible in ordinary use. Chip wash wear occurs on removable band which is replaceable at seventy-five cents with immediate delivery. Four different shapes of Wessonmetal "High Performance Quality Controlled" Carbide inserts available for these holders.

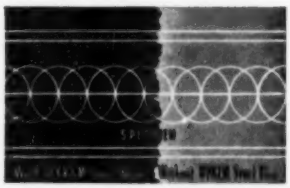
Write Today for Bulletin No. 511

WESSON COMPANY
FERNDALE, MICHIGAN
AFFILIATED WITH WESSON METAL CORP., LEXINGTON, KY.

NAME_____
STREET_____
CITY_____
STATE_____

DYKEM STEEL BLUE

STOPS LOSSES
making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

THE DYKEM COMPANY, 2301 B North 11 St., St. Louis, Mo.

"YANKEE"
offset ratchet handle reaches screws "YOU CAN'T GET AT"

CONVENIENT
POWERFUL
VERSATILE

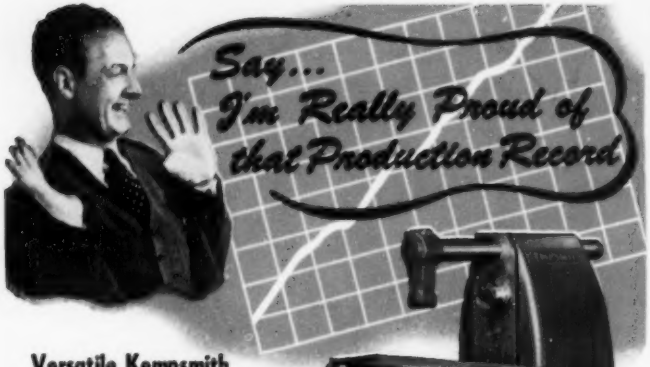
No. 3600 "Yankee" Offset Handle and Adapters drive hollow head set screws, socket head cap screws, Phillips recessed head and slotted screws, even in hard-to-reach places. Select the Handle and Adapters for *your* job from the Merchandiser illustrated, at your distributor's. North Bros. Mfg. Co., 201 West Lehigh Ave., Philadelphia 33, Pa.

YANKEE TOOLS NOW PART OF
STANLEY
THE TOOL BOX OF THE WORLD
NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

New FEDERAL Smooth-Air Clutch and Electro-Pneumatic Controls give

JET SPEED TO PRESSWORK!

These new Federals give "jet speed" to presswork. They are the perfect answer to faster production. With the new Smooth-Air Clutch and Electro-Pneumatic Controls, speeds may be increased safely; without damage to work, without sacrificing precision, and with no more than normal wear, thanks to balanced Federal construction. Operation is simpler — less fatiguing. May be "inched", single tripped, or operated continuously. Sizes 6 to 80 tons. Prompt delivery on all models including standard and dial feeds. Write for catalog.



Versatile Kempsmith Milling Machine Proves Ideal for Long Production Runs

You'll find the new Kempsmith LH Miller gives you a rugged, lightweight machine that combines simple, rigid construction with maximum flexibility. It enables you to attain your production goals on such jobs as small end milling, high speed jig boring, keywaying, oil grooving, light straddle milling, etc. Designed by experienced Kempsmith Engineers . . . men who have met the milling machine requirements of industry for more than 60 years. Write for your copy of Bulletin No. 127 describing this versatile machine.

KEMPSMITH LH MILLER

LOW in Initial Cost and Upkeep
HIGH in Accuracy and Rigidity

KEMPSMITH MACHINE CO.
1823 SOUTH 71ST STREET
MILWAUKEE 14, WISCONSIN, U. S. A.

KEMPSMITH
Precision Built Milling Machines Since 1888

BALANCING FOR MASS PRODUCTION

"HI-EFF"
BALANCING MACHINES
Fast . . . and Accurate!

● The sure way to cut vibration, get longer life and greater safety from your product, is to balance rotating parts. And Taylor HI-EFF Static Balancing Machines assure you of sensitive, accurate, high-speed production balancing.

Use HI-EFF machines for balancing fans, impellers, tires, grinding wheels, brake drums, sheaves, pulleys and many other products. 300 auto fans per hour, 200 auto tires per hour, 80 grinding wheels per hour, 60 clutch assemblies per hour . . . these are typical reports from users.

HI-EFF Static Balancing Machines are now offered in nine different capacity models—and other models are available to meet special requirements. Taylor engineers will be glad to make recommendations for your specific problem. *Write for descriptive Bulletin No. 761.*

● DYNAMOMETERS ● STATIC BALANCERS
PRECISION DRILLING MACHINES

TAYLOR DYNAMOMETER AND MACHINE COMPANY
528 WEST HIGHLAND
DEPT. M, MILWAUKEE, WIS.

---

for **SMALL JIG BORING**

PUT SMALL JOBS ON THIS **LINLEY MACHINE**

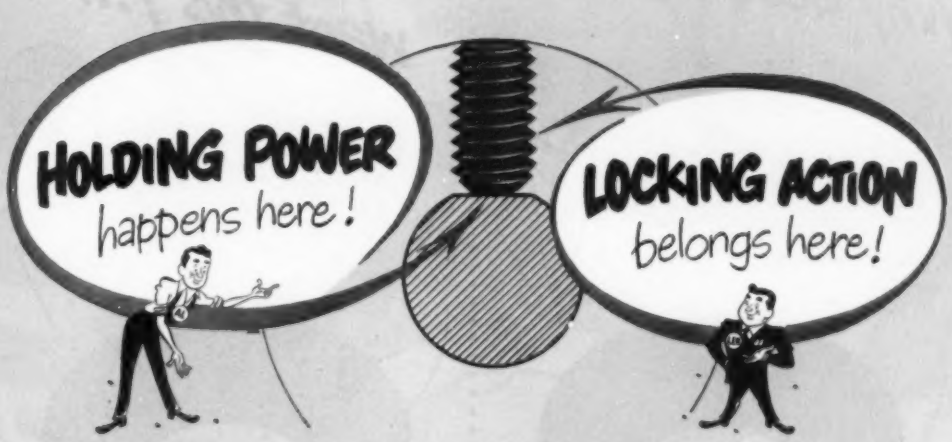
and save your larger machines for heavier work.

YOU'LL BE SURPRISED! at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7" x 17½" table size.

Write TODAY for Full Information

LINLEY BROTHERS COMPANY
644 STATE ST. EXT., BRIDGEPORT 1, CONN.

WHEN YOU SPECIFY SET SCREWS, REMEMBER . .



To do its job a set screw must *hold firmly* against both rotation and sideway motion, and it depends entirely on the *point* for this holding action.

Allen ○ screws hold better because they have the strength to permit firmer tightening, and because the points are designed *only* to produce maximum holding power.

Allen design does not compromise the holding power of the point in an attempt to make it perform a locking function too. Allen ○ screws require no locking action at the point, because of their high uniform accuracy of fit, pitch diameter and perfect thread lead. This provides maximum thread contact with ample friction to lock the screw in position during use and *re-use* under extreme vibrating stress.

THE **BUY** WORD IN SOCKET SCREWS IS **ALLEN**

Why accept this?... when you actually want this?...

CARMET blanks are preformed to your order!

ATTENTION INDUSTRIAL DISTRIBUTORS:

Ask us about handling CARMET standard tools and blanks in your area. Some territories are open. Write, phone, or wire.

ADDRESS DEPT. AM-32

Above are shown two carbide metal rolls of identical composition. The one at the left cost the user about nine times as much as the one at the right. That differential was due solely to grinding vs. non-grinding. The plain face needed serrating, whereas the ready-toothed face needed nothing.

In many uses where tolerances are not too critical, CARMET blanks *preformed* to your specifications are ready for service without additional costly grinding. On jobs where finish grinding is necessary, the quality of Carmet's preforming holds grinding stock to a minimum.

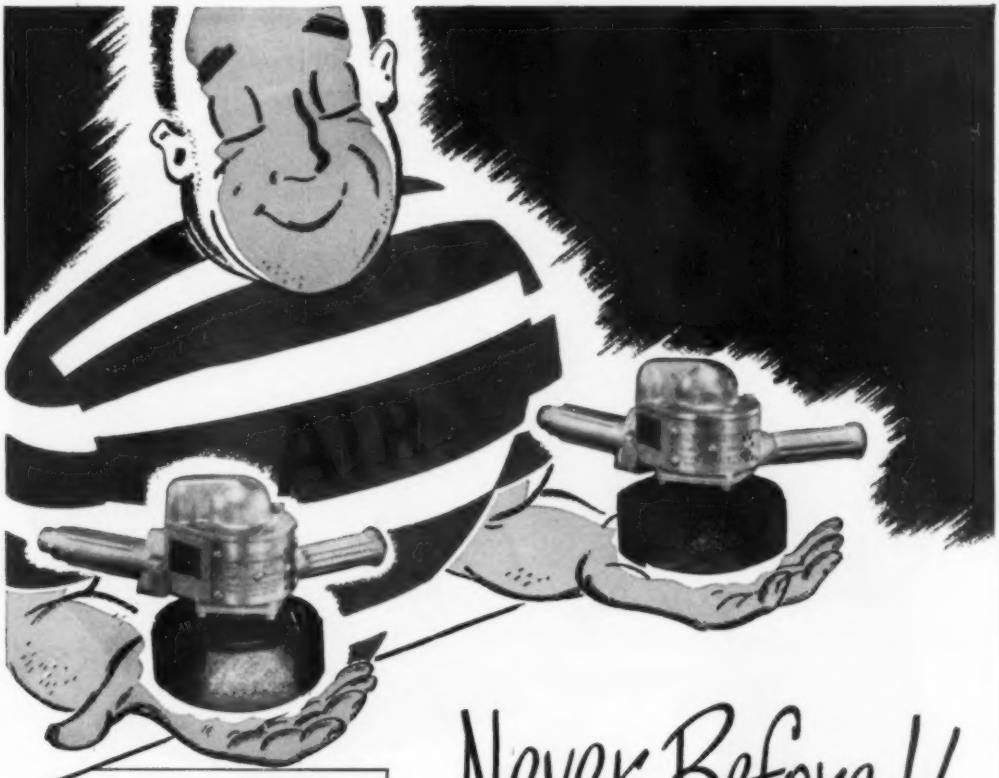
Hundreds of special shapes can be preformed in Carmet. For practical suggestions that fit your needs, call or write your nearest A-L representative. ● *Allegheny Ludlum Steel Corporation, Carmet Division, Wanda & Jarvis Avenues, Detroit 20, Michigan.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

W&D 4048

AL FINE TOOL STEELS SINCE 1854



Never Before!!

...SO MUCH POWER PER POUND

THE NEW B-35

Weight	10¾ lbs.
Height	7½ inches
Spindle	⅝" - 11"
6000 - 5500 - 4500 - 3500 RPM	

THE NEW B-12

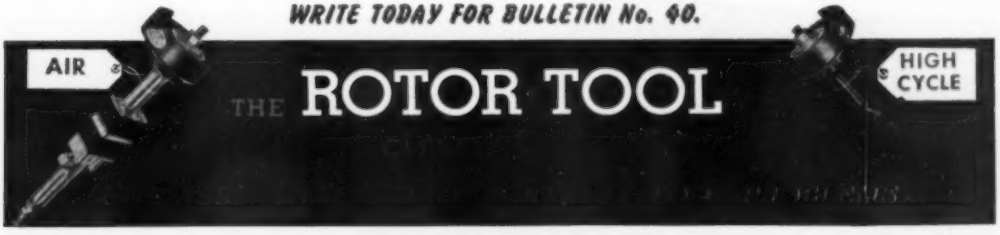
Weight	10 lbs.
Height	7 inches
Spindle	⅝" - 11"
6000 - 5500 - 4500 - 3500 RPM	

For cup wheels, sanding pads, cut-off wheels, wire brushing.

MEET the new Rotor Vertical Air Grinders! Never before have you had so much power in vertical air grinders...for such light weight! They're well balanced . . . easy on the operator. Here are *new* features to speed up your metal removal.

AIR O'TOOL

WRITE TODAY FOR BULLETIN No. 40.



How to make friends

of your customers' plant engineers....

good judgment calls for

PARKER-KALON®

when good design calls for

SOCKET SCREWS

The opinion of your customers' plant engineers and maintenance crews carries a lot of weight when the time comes to order additional equipment.

You can make friends for your product by assembling it with P-K Size-marked Socket Head Cap Screws. Each screw has the size clearly incised on the head. It's easy to tell which screw goes where.

Saves you time in product assembly, too. Sizes are issued correctly, used correctly. There's no time lost checking and changing, no spoiled work. It puts screws back in use that might otherwise be wasted because sorting is "too much bother".

Since there are no better quality Socket Screws available at any price, why not give your product the plus of the exclusive P-K Size-marked Gear Grip features? Ask for samples. Parker-Kalon Corporation, 200 Varick Street, New York 14.

DELIVERIES ARE BETTER CHECK WITH P-K FIRST

Your P-K DISTRIBUTOR *has good news. His stocks of P-K Screws are steadily improving. The size and type you need may now be readily available. Ask him about it. Remember— "If it's P-K . . . it's O.K."*

SIZE-MARKED SOCKET HEAD CAP SCREWS • GROUND THREAD SOCKET SET SCREWS • FLAT HEAD SOCKET CAP SCREWS • STRIPPER BOLTS • PIPE PLUGS • HEX KEYS

SURROUNDED BY PLUS VALUES

THE LEES-BRADNER "40" THREAD MILLER

It takes precision plus to thread shell cases accurately for the reception of delicate fuse mechanisms. Speed, easy loading and semi-automatic operation are other important considerations.

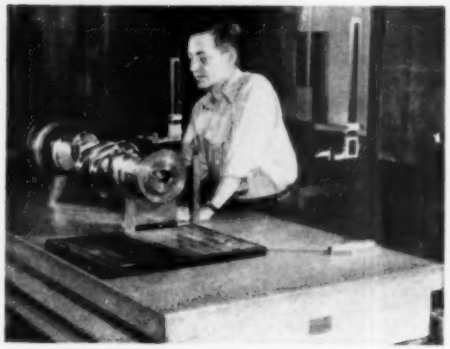
That's why the Lees-Bradner Model "40" Thread Miller was chosen to perform this highly important operation.

You, too, can get unusual accuracy at high speed and with a minimum of scrap on precision threading operations. Just contact your Lees-Bradner representative and ask him for all the details on this remarkable machine.

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

PRECISION PRODUCES PROFITS



You need precision to make mass production profitable. And you need absolute accuracy—in tool rooms, inspection and quality control—to insure precision. And *that* means you need Herman Stone pink granite surface plates.

Why granite? Because granite is unmatched for hardness and permanence; it will not rust, warp or corrode; it is non-magnetic and temperature-resistant.

Why pink granite? Because numerous impartial tests, by recognized testing laboratories and users of surface plates have proved that pink granite surface plates are many times more accurate, and far more durable than ordinary surface plates.

Why Herman Stone pink granite? Because, as the originator and pioneer developer of granite surface plates, Herman Stone has the knowledge, experience and specialized facilities necessary to finish specially selected granites to tolerances as low as .00005".

A Herman Stone granite surface plate costs no more today than in 1941! Better write today for complete information—there's no obligation.

The world's largest granite surface plate, 96" x 192", produced by The Herman Stone Co. for an Ohio automotive industry plant, provides 18,432 square inches of absolute accuracy within a tolerance of .002".

Produced by Nature . . . Perfected by

The Herman Stone Co.

324 Harries Bldg. • DAYTON 2, OHIO • FUlton 2731

VICKERS HYDRAULICS

Help S-T-R-E-T-C-H DEFENSE DOLLARS

BATH CONTOUR FORMERS *produce* Special Shapes at Lower Cost

Special shapes for war planes and jet engines—of such metals as inconel, Haynes stellite, vanadium and titanium as well as aluminum alloys—are formed to a high degree of accuracy by cold stretching on the new Bath Contour Formers, having capacities from 12½ to 150 tons.

Vickers Vane Type Pumps furnish the hydraulic power for the clamps which grip each end of the work, and for the hydraulic cylinder which holds correct tension as the turntable revolves and the metal is stretch-formed. Vickers Valves assure correct tension and provide automatic overload protection . . . also easy and accurate control from the pulpit.

This is just one of many hundreds of ways in which Vickers Hydraulics improves operation and lowers cost. It is to the advantage of machinery builders to work with Vickers factory-trained application engineers who can cooperate effectively on the most complicated machinery. Get in touch with the Vickers office nearest you.

VICKERS Incorporated • 1410 OAKMAN BLVD. • DETROIT 32, MICHIGAN
DIVISION OF THE SPERRY CORPORATION

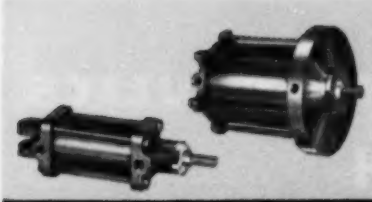
Application Engineering Offices: ATLANTA • CHICAGO (Metropolitan) • CINCINNATI • CLEVELAND • DETROIT HOUSTON • LOS ANGELES (Metropolitan) • NEW YORK (Metropolitan) • PHILADELPHIA • PITTSBURGH ROCHESTER • ROCKFORD • ST. LOUIS • SEATTLE • TULSA • WASHINGTON • WORCESTER

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

WRITE FOR A COPY OF CATALOG 5000

4762

Representative Vickers Hydraulic Pumps and Controls Used on Bath Contour Formers



Pneumatic Cylinders

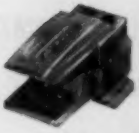
Really complete, the Hannifin line of pneumatic cylinders is made with two types of pistons . . . bores from 1" to 16" . . . six standard mountings. Really standard, these cylinders are tooled to tolerances that assure accurate mounting to make assembly to your machines easier. Really built, each cylinder is "TRU-BORED" and honed, piston rods are ground and polished, interchangeable end caps, heavy duty tie rods . . . rugged, yet precision construction throughout!

Write for Bulletin 210

NOW...

HANNIFIN HAS THE MOST COMPLETE LINE OF AIR CONTROL EQUIPMENT!

Disc Type Air Control Valves



Sliding disc type air-operated valves (Provide effortless hand or foot control)

Designed for smooth, positive and accurate control of air-operated equipment. Bronze discs lapped to perfect seal with seats. Packless design. For hand, foot or electrical operation. Sizes from ⅛" to 1¼" I.P.S.

Write for Bulletin 57-W

Hannifin "Directair" electrically controlled air-operated disc valve

AIR WARDEN

Hannifin "Air Warden" units are the finest protection possible for air-operated equipment. Complete units include: (1) Air Filter which removes grit, dirt, scale, moisture, emulsified oil; (2) Self-Bleeding Pressure Regulator that assures absolute stability of secondary pressure; and (3) Atomizing Type Lubricator fillable without shutting off air pressure. Components also sold separately. Write for Bulletin 10108

Foot-operated treadle valve (Also spring return and rotary types)

Standard hand control valve (Single or duplex)

do ALL you CAN do... with

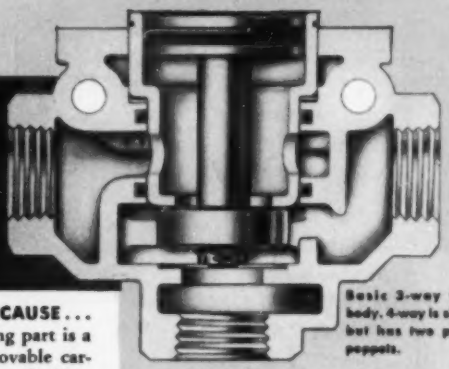
HANNIFIN

Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

PLUS... A Line of Valves Every Maintenance Man Will Appreciate!

NEW HANNIFIN *P-M* *Pilot-Master Valves*



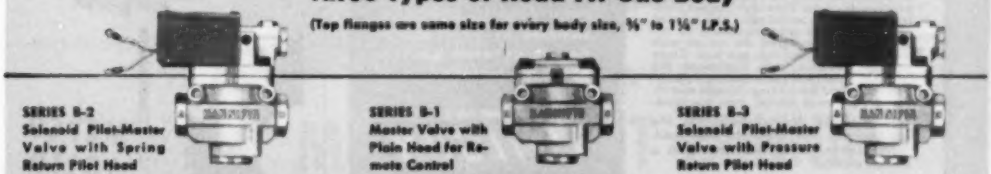
Basic 3-way valve body. 4-way is similar but has two piston poppets.

THIS NEW DESIGN REDUCES DOWN TIME, BECAUSE... there are no springs in the main valve... only moving part is a piston-poppet assembly which fits in an easily removable cartridge, replaceable without disturbing line connections. Besides, in the entire line, there are only two body designs, one for 2-way and 3-way, another for 4-way. The basic 3-way valve operates either 2-way or 3-way, normally open or normally closed, without any internal change whatever. Interchangeable heads give choice of pneumatic or electric control. What all this means is fewer valves to stock, fewer parts to stock, less time lost replacing valves, parts, or control heads.

- **Fewer Valves to Stock**
- **Fewer Parts to Stock**
- **Maximum Interchangeability**
- **No Springs in Main Valve**

Three Types of Head Fit One Body

(Top flanges are same size for every body size, ⅜" to 1¼" I.P.S.)



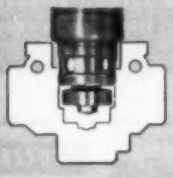
SERIES B-2 Solenoid Pilot-Master Valve with Spring Return Pilot Head

SERIES B-1 Master Valve with Plain Head for Remote Control

SERIES B-3 Solenoid Pilot-Master Valve with Pressure Return Pilot Head

features you find in no other valves, compare!

New cartridge design—instantaneous operation, provides speeds to 600 cycles per minute—continuously rated, low amperage solenoids, positively mounted—full pipe capacity—pressure range from 15 to 150 P.S.I.—corrosion resistant throughout—will operate on liquids as well as air—choice of 10 Pilot Valves, ¼" I.P.S., for remote control of Master Valves.



Exclusive Replaceable Cartridge

Contains every moving part of Master Valve. Two sizes fit all 5 valve sizes. Easily replaced without disturbing main piping connections.

Write for the Complete Story

Get it today!

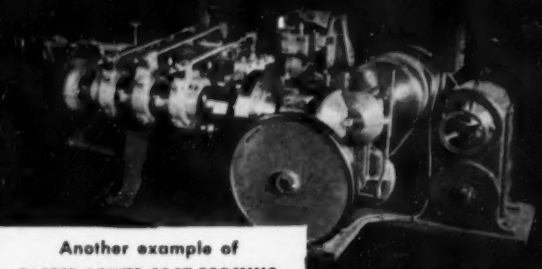
Bulletin 231. Shows and tells all about the new Hannifin P-M line... Pilot Valves, Master Valves, Pilot-Master Valves... 2-way, 3-way, 4-way.

HANNIFIN

Hannifin Corporation, 1117 S. Kilbourn Ave., Chicago 24, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

PRODUCTION RECORDS *Broken* with NILSON 4-SLIDE Machine!



Another example of
FASTER, LOWER COST FORMING of Ribbon Metal Stock

★ *180 Terminal Contacts* **Per Minute**

★ *7 Separate Operations* **Eliminated**

A famous national manufacturer tripled production of the Terminal Contact illustrated above (in actual size) and reduced production costs proportionately by replacing several progress die set-ups with one **Nilson 5-3-F** four side machine. *Seven separate operations were eliminated;* 180 completed contacts produced per minute. Time required for tooling changes was reduced 50% over similar type machines.

This example clearly shows the big savings you can make in overhead, maintenance, labor and time with a Nilson 4-slide!

Taking stock directly from the coil, **NILSON** metal ribbon stock four-slide machines automatically feed, straighten, pierce, blank, swage, stamp, rain, cut off and perform up to five forming operations with speed and accuracy. Built in five models with capacities up to 2 1/2" wide and feed lengths up to 15". For specific recommendations on your wire and ribbon metal forming problems, send details, prints or samples of your operation to us when you request the bulletin.

THERE'S STRONG LIFE IN A **NILSON**

Specialists in Wire Forming Equipment for Over 50 Years

THE A. H. NILSON MACHINE COMPANY

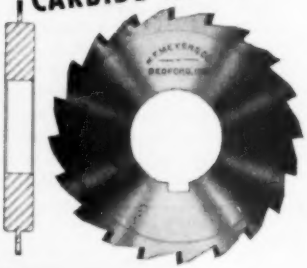
1508-A RAILROAD AVENUE, BRIDGEPORT 5, CONNECTICUT

OTHER NILSON PRODUCTS

- Automatic chain-making machines
- Automatic staple forming machines
- Wire and Stock reels
- Foot Presses
- Wire straightening equipment
- Slide Feeds for Presses

PRECISION CIRCULAR CUTTERS

MEYCO CARBIDE TIPPED



MEYCO SOLID CARBIDE

MEYCO saws and cutters in various diameters and thicknesses can be furnished to your individual specifications. MEYCO cutters have earned an enviable reputation where long tool life and precision are a must.

Increase production in your slotting, venting and slitting operations by using MEYCO cutters. Please furnish complete specifications and quantities desired when requesting prices and indicate material to be cut.

Manufacturers of precision tools since 1888

W. F. MEYERS CO., INC.
BEDFORD, INDIANA

"BUZZER" INDUSTRIAL GAS BURNERS

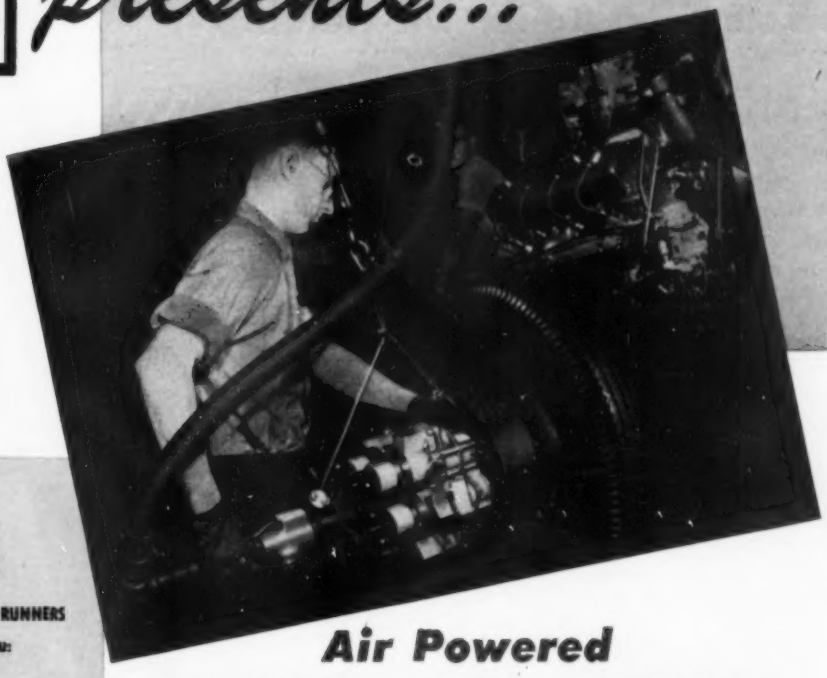
RING ★ PIPE ★ NOZZLE

Equipped with Venturi Air Mixers. No blower or power necessary. Just connect to gas supply. Designed for utmost efficiency, economy, simplicity and flexibility. Many types and sizes available.

Write today for catalog.

CHARLES A. HONES, INC.
171 South Grand Avenue, Baldwin, L. I., N. Y.

IR *presents...*



MULTIPLE NUT RUNNERS

give you:

2 or more nuts driven at once . . . in the time formerly required to drive one.

•

Good "quality control" . . . Torque is uniform on each and every nut.

•

Safe Operation for operator . . . Torque reaction is non-existant.

•

Immediate on-the-job operation . . . No special training needed for the operator.

•

Low Maintenance . . . Units in service show maintenance savings up to 50%.

Air Powered

MULTIPLE NUT RUNNING

with "Quality Control"

For years multi-spindle machines have saved time and dollars . . . Now you can tool up for *multiple savings* with Ingersoll-Rand Multiple Nut Runners.

Multiple nut running is a logical sequel to multiple drilling, tapping and reaming. Ingersoll-Rand Multiple Nut Runners are built to your specifications. Our powertool specialists will gladly go over your nut running jobs with you and make their recommendations—there's no obligation on your part.

Don't pass up this opportunity to get the full story on the latest and most important development in the field of production.

Send for your copy of Bulletin 5099.

Ingersoll-Rand

742-B

11 BROADWAY, NEW YORK 4, N. Y.

originators and pioneer developers of

APEX bit holders

Want to lower your fastening costs? Reduce your bit inventory? Save on tool costs and conserve steel? Then switch—now—to Apex bit holders and insert bits.

Any one Apex bit holder will accommodate a full range of Apex insert bits to drive Phillips, Frearson (Reed & Prince), Slotted, Clutch Head or Socket Head screws. Bits "float" slightly in the holder, assuring easier alignment with screw recess, increasing bit life. Because the bits can be quickly and easily interchanged, you need only a minimum bit inventory to meet all your screwdriving requirements.

Bit holders, made to fit all popular makes of air, electric or spiral drivers, last indefinitely. When bits become worn, simply discard them —it costs no more for a new Phillips or Frearson insert bit than it would to recondition a standard power bit.

The same Apex insert bits may also be used with Apex hand drivers and service drive bit holders. Complete specifications and prices are shown in our new Catalog 26 — write, on your company letterhead please, for your copy.

U. S. Patent No. 2,522,217 Canadian Patent No. 440632

and insert bits

to drive these screws:

SOCKET HEAD · CLUTCH HEAD · SLOTTED · PHILLIPS · FREARSON (Reed & Prince)

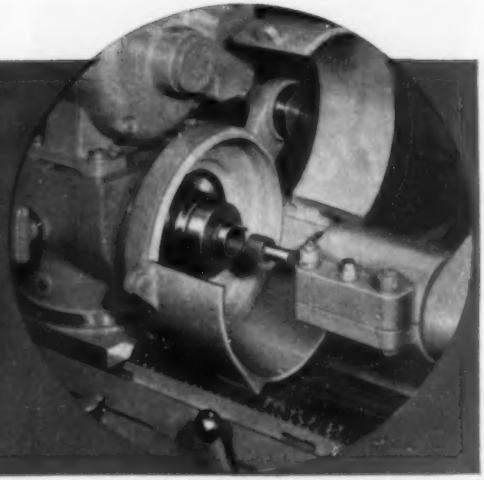
APEX TOOLS bit holders and insert bits

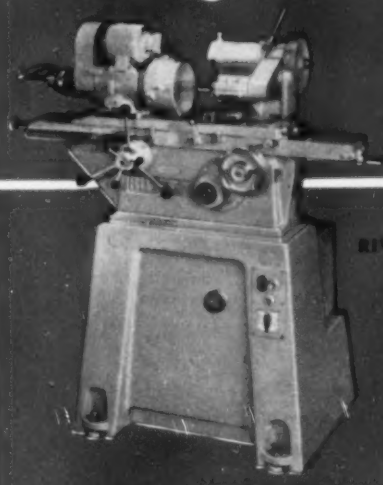
THE APEX MACHINE & TOOL COMPANY

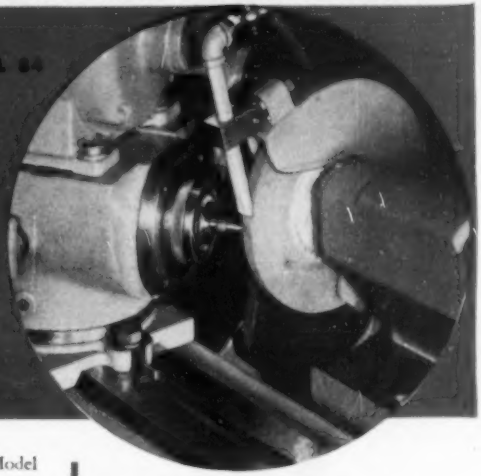
1026 S. Patterson Blvd., Dayton 2, Ohio

POWER BITS, INSERT BITS AND BIT HOLDERS, FOR PHILLIPS, FREARSON (Reed & Prince), SLOTTED, CLUTCH HEAD and SOCKET HEAD SCREWS • HAND DRIVERS FOR PHILLIPS, FREARSON AND CLUTCH HEAD SCREWS • TWO-PIECE DRIVERS FOR HEX HEAD SCREWS • SOCKETS, EXTENSIONS, ADAPTERS AND NUT SETTERS • UNIVERSAL SOCKETS, EXTENSION WRENCHES AND ADAPTERS • AIRCRAFT AND INDUSTRIAL UNIVERSAL JOINTS • SELF-RELEASING AND ADJUSTABLE STUD SETTERS • SAFETY FRICTION TAPPING CHUCKS • VERTICAL FLOAT TAPPING CHUCKS.

A new small hole grinder







Easily converted for external grinding

Flexibility keynotes this new Rivett Model 84. Primarily a small hole grinder, it may be equipped for external grinding. Simplicity reduces set-up time on the variety of work normal to the tool-room and die shop. Collets and step chucks quickly mount single or repetitive pieces.

The new Rivett 84 grinds holes from the smallest up to 3" diameter, with a maximum 4" depth depending upon diameter; external work to 3" diameter by 4" length.

If you need versatility with extreme accuracy, you will want to learn more about this new grinder. Send for Catalog 84.

FEATURES

- ★ Optional Wheelheads for internal and external spindles.
- ★ Internal Spindles 12,000 to 35,000 r.p.m.; sealed from grit and pre-lubricated for life.
- ★ Lathe-Type Workhead Spindle mounts draw-in collets and step chucks directly.
- ★ Micrometer Table Stop for positioning work when shoulder grinding.
- ★ Mechanical Power Table Travel with infinite adjustment of speed and stroke.
- ★ Hand Table Travel with coarse and fine feeds graduated to .001".
- ★ Hand Infeed with coarse adjustment to .001", and fine to .0001" reduction of work diameter.

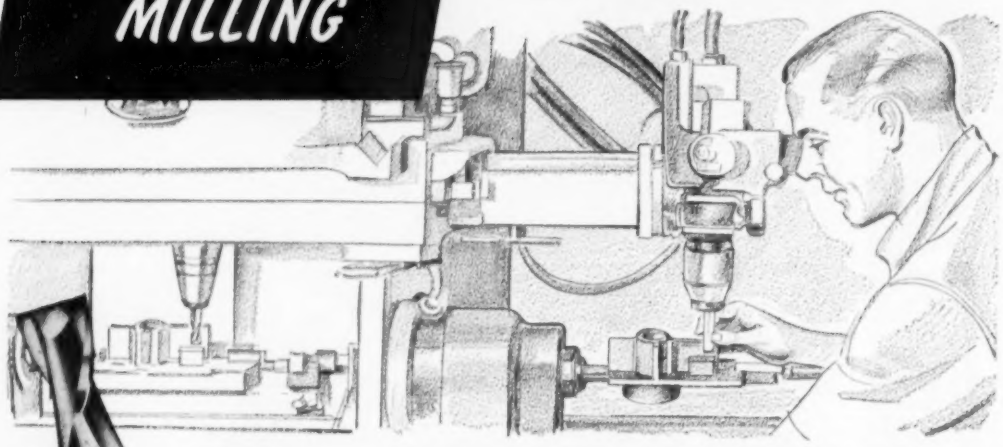
RIVETT **LATHE & GRINDER, Inc.**

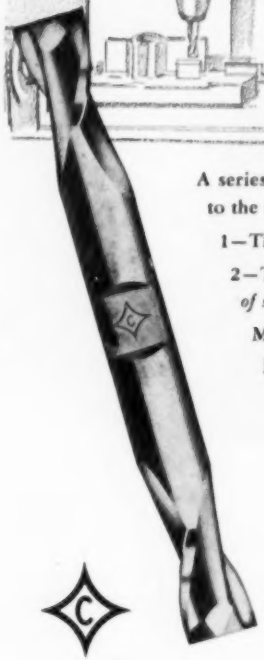
Dept. AMR-8, Brighton 35, Boston, Massachusetts

For More Precision Work RELY ON RIVETT LATHES AND GRINDERS, The Master Craftsman's Master Tools

HIGH SPEED MILLING

WITHOUT LOSS OF SURFACE FINISH





A series of tests on a template follower job, illustrated above, proved conclusively to the user that *Cleveland* End Mills have two outstanding features:

1—They possess *unusual chip clearing ability.*

2—They permit the use of higher speeds and feeds than other mills *without loss of surface finish or tool life.*

More than two years ago the entire line of *Cleveland* End Mills was completely redesigned. Since that time they have been tested repeatedly in customers' plants—and always have been found superior in chip clearing, accuracy, strength, durability, long life and cutting speed. If *you* have not experienced the many advantages of these tools, we urge you to . . .

TELEPHONE YOUR INDUSTRIAL SUPPLY DISTRIBUTOR

THE CLEVELAND TWIST DRILL CO.

1242 East 49th Street • Cleveland 14, Ohio

Stockrooms: New York 7 • Detroit 2 • Chicago 6 • Dallas 2 • San Francisco 5 • Los Angeles 58

E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

Give Your Ejection Problems the Air

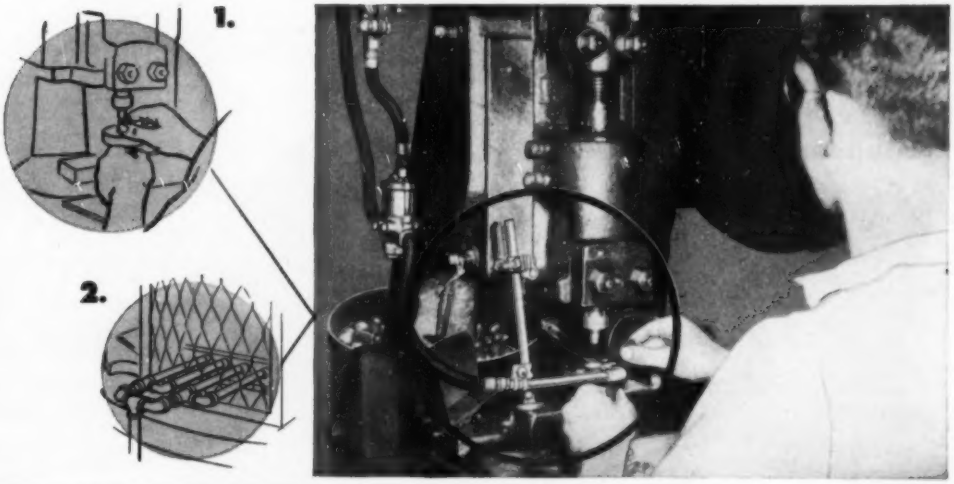
...and boost production and safety

❶ End slow, dangerous hand removal of work with a Schrader Air Ejection Set. Install Schrader Air Ejection Sets on your power presses—or any machines with moving parts to actuate a cam or sliding tripper. You'll find production soars—up to 100%... operator safety is boosted 50%. Replace hand removal with Schrader Air Ejection and watch your presses take a new lease on life.

❷ Replace wasteful, homemade steady air blasts with Schrader Air Ejection Sets. Air costs drop as much as 90% because Schrader Air Ejection Sets ration out *just enough* air to do the job... synchronize your air blast with demand. Before you decide your old compressors have reached full capacity, check with Schrader to see how to cut air waste.

Schrader Air Ejection Sets are delivered fully assembled and ready to go to work. Their low cost is more than repaid in just a few weeks.

See how Schrader Air Ejection Sets will help you plan more effective use of machines. Write, describing the machines on which their use is contemplated—or fill out the coupon below.



Schrader products control the air

REG. U. S. PAT. OFF.

Air Cylinders • Operating Valves • Press & Shear Controls • Air Ejection Sets • Blow Guns • Air Line Couplers • Air Hose & Fittings • Hose Reels • Pressure Regulators & Oilers • Air Strainers • Hydraulic Gauges • Uniflare Tube Fittings

Mail This Coupon Today

A. SCHRADER'S SON
Division of Scovill Manufacturing Company, Incorporated
460 Vanderbilt Avenue, Brooklyn 17, N. Y., Dept. F-2

I am interested in more information on.....

Name..... Title.....

Company.....

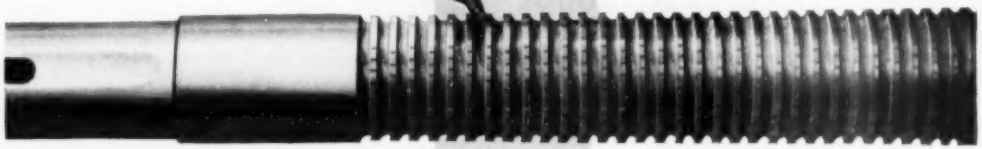
Address.....

SAVE WEEKS OF VALUABLE TIME!
It's easy to SHARPEN all types and sizes of BROACHES with this

VERSATILE LAPOINTE
UNIVERSAL BROACH SHARPENER

Built with simplified "Touch-Controls", it practically eliminates all need for skill in sharpening broaches. Any reasonably good tool man can do an expert job in no time at all!

We design and build a complete line of standard and special broaching machines, tools and fixtures.



Available in 3 SIZES: 60", 72" and 80", the LAPOINTE Universal BROACH SHARPENER occupies a surprisingly small floor area and will soon pay for itself *in time saved and money earned.* Attachments are available for backing-off.

Ask us about the **NEW 36" LAPOINTE Broach Sharpener** *designed especially for surface broaches. This sharpener has no head and tail stock, but uses a vise only. "Touch-Control" enables the operator to remove a minimum of stock, thus prolonging the life of the tool.*

Every plant that owns a broaching machine needs the LAPOINTE Manual on Broach Sharpening.

Ask for Booklet BSM-2

50 YEARS IN BROACHING!
We're the oldest in the world!
1902 • GOLDEN ANNIVERSARY • 1952

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.
Branch Factory: Watford, Herts., England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

MILFORD

...4 modern plants on industry's doorstep to expedite service of your needs for QUALITY Tubular and Split Rivets, Rivet-Setting Machines and Special Cold Headed Fasteners.

You are invited to enlist Milford Rivet's Design Engineering Service without obligation. Write today.

Est. 1919

the MILFORD RIVET & MACHINE CO.

24 Bridgeport Ave., MILFORD, CONN.
1100 W. River St., ELYRIA, O.
820 Illinois Ave., AURORA, ILL.
20 Platt St., HATBORO, PA.

Whiton

INDEPENDENT LATHE CHUCKS

MULTI THRUST Feature

Gives Jaws "Steel Finger" Action

- Tighter Gripping
- More Rigidity
- Greater Accuracy
- Even Distribution of Pressure

Work Holding Problems? Write Whiton

Ask for catalog, too.

Try it yourself. Pick up a piece of work in your fingers. That's ordinary holding. Now squeeze . . . that's Whiton Multi-Thrust "Steel Finger" action.

Makers of Fine Chucks • Steam Turbines • Centering Machines •

THE WHITON MACHINE COMPANY
NEW LONDON, CONN.

NEW Amazingly Effective!

CROWN Rust Inhibitor

(Pat. Pending)

Spray or DIP

ONE Application Stops Rust for Months*...Retards Rust Already Started....

CROWN Rust Inhibitor is a new and remarkable preventive proved in both shop use and by laboratory tests. Effective against rust caused by humidity, moist hands—even salt spray! . . . *Just put it on and leave it on.* Not a messy, smeary oil or hard drying film. Harmless to hands, metal, plastics. Highest quality animal wax base will not gum or clog under heat or friction. Can be used on damp metal. Protects during storage or shipment. Need not be removed from tools or equipment before using. Resists rubbing off, but can be removed easily with gasoline or kerosene . . . In aerosol-type can for handy spray application—or apply by dipping.

MONEY SAVING PROTECTION FOR:

- Finished Goods
- Tools
- Stock in Bins
- Spare Parts
- Precision Equipment
- FOR ANYTHING THAT'S VALUABLE AND SUBJECT TO RUST!

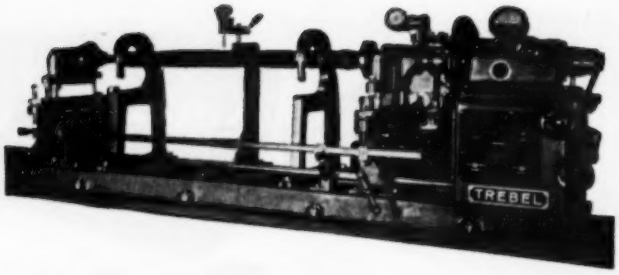
*Indoors—in average conditions

ORDER TODAY
$2.00 per 12-oz Trial Can
Discount for cases of 12. Also in bulk. Write for details and discount.

CROWN INDUSTRIAL PRODUCTS CO.
412 Borden Ave., Sycamore, Ill.

Please ship at once
_____ (How Many?) cans
_____ (How Many?) cases

NAME _____
COMPANY _____
OUR PURCHASE ORDER NO. _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____



Balancing this 60" propeller shaft is no trouble with a TREBEL

THE propeller shaft is first dynamically balanced by spot welding two compensating weights onto the shaft ends near the universal joints. The exact size and location of these weights is indicated by the machine. Shaft is then accelerated to its critical speed and amount of deflection *read off a dial*. A third weight is welded on in the middle of the shaft opposite the point of maximum deflection to insure a smooth running condition at all speeds.

A variable high speed control, free wheeling, safety latches and tachometer are provided for the spin test.

Shafts up to 96" long, weighing from 20-130 pounds are accurately and quickly balanced in the TREBEL DEK 60e DYNAMIC balancing machine —also crankshafts, flywheels, electric armatures, etc. with a range of 20-260 pounds. Guaranteed accuracy is .1 ounce-inches or .00002 inches displacement of center of gravity.

Unique Balancing Principle using a counter force to compensate for unbalance eliminates complicated setups and makes possible the indication in simple, easy-to-read units such as length of wedges in inches, or depth of a standard diameter hole, etc. Delivery is prompt. May we send you full details?

See the TREBEL in operation in New York, Detroit or our Cleveland Service Center.

KO **KURT ORBAN** COMPANY, INC.

205 East 42nd St., New York 17 • 4220 Prospect Ave., Cleveland 3 • 19450 James Cousens Highway, Detroit 35
Canadian sales by European Machinery Ltd., 11 King St. West, Toronto, Canada

How to Work Clad Materials

Proper application of clad materials can cut costs and save scarce metal. Output of clad materials has more than doubled since 1946 . . . has climbed to more than 23,000 tons per year and may reach 1,000,000 tons by 1960. Clad materials offer advantages that may well have profit-wise applications in your business.

Clad materials are not difficult to work, require only care and routine experience. "How to Work Clad Materials," an *American Machinist* Special Editorial Report, contains all the latest facts on how to work clad materials most efficiently and profitably. This 16-page report, complete with informative drawings, diagrams, and photographs, is still available for only 25¢ a copy. Write to Reader Service Department:

American Machinist
McGraw-Hill Building
New York 36, N. Y.

From the *American Machinist* Library of *Tips for Top Shop Men*

TAKE a man's pride in his job away, and there isn't much left; he becomes another automaton. Even a trained seal enjoys the applause as much as he does the fish.

WHEN you walk the tight-rope between close tolerances, or between good and bad finish, balance is vital. Be sure you have it, in machine-tool spindle or shaft, in tooling, in fixture. It will pay out in longer tool life and reduced scrap.

"no more GAMBLING on tool steel selection"

[½ actual size; Selector is in 3 colors]

That's what one of the thousands of pleased users says about his CRUCIBLE TOOL STEEL SELECTOR, the new, simple, handy method of picking the right steel, *right* from the start. Since Crucible announced this Selector two years ago, thousands of tool steel users have received their Selectors . . . and here's what some of them say—

"Handiest selector I've ever seen!"

"Saves me time and headaches"

"It's so logical—you begin with the application".

You can be sure the answer you get with your Crucible Tool Steel Selector will be just right in every case, for this Selector covers 22 tool steels which fit **98% of all tool steel applications.** And when—with a flip of the round dial—you get the answer, you'll get the steel FAST, too, because all the tool steels on the Selector are right in stock, in all our 26 conveniently-located warehouses.

This Selector is bound to be a big help to you—so write for yours today. There is no obligation whatsoever. Just fill in the coupon and mail now . . . before you turn this page and forget! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, New York.

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!

Crucible Steel Company of America
Dept. A, Chrysler Building, 405 Lexington Avenue
New York 17, N. Y.
Gentlemen:
Sure! I want my free CRUCIBLE TOOL STEEL SELECTOR!
Name _____ Title _____
Company _____
Street _____
City _____ State _____

CRUCIBLE

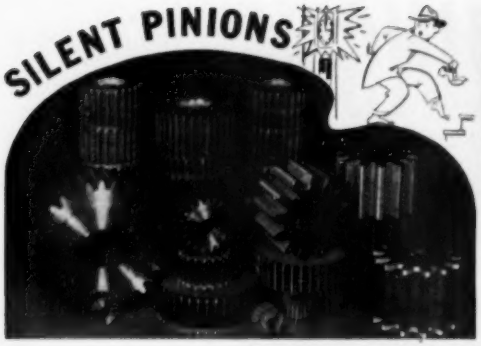
first name in special purpose steels

TOOL STEELS

52 years of Fine steelmaking

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

SILENT PINIONS



When your needs call for silent gears and pinions, get them from Stahl. Whether fabroil, bakelite or rawhide, Stahl has the experience and specialized equipment to make them right, in any size or any quantity. For prompt delivery and attractive quotations, get a Stahl estimate first.

SPURS TO 72" PD, 1 DP
BEVELS TO 54" PD, 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP
CONTINUOUS-TOOTH HERRINGBONE TO 60" PD, 2 DP
SPROCKETS TO 72" PD, 2½" CP
RACKS TO 20 FT. LONG, 3 DP
SILENT GEARS: RAWHIDE, BAKELITE, FABROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

Stahl
GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland 14, Ohio

Cincinnati
GEARS STAND UP!

After years of use Cincinnati Gears continue to set performance records that satisfy the exacting demands of hard-driving industry. Custom-made to your specifications. Electronically tested to assure quiet operation.

Spur Herringbone Spiral Bevel
Helical Internal Spline Shaft
Worm Coniflex Bevel

THE CINCINNATI GEAR COMPANY
"Gears Good Gears Only"
Wooster Pike and Marlemont Ave. • Cincinnati 27, Ohio

ACME QUALITY
GEARS
Always Meet Our Specifications

For twenty-five years Acme Gears have been giving unsurpassed service in industrial, automotive, marine and aircraft equipment.

Acme facilities include over one hundred major machine tools for gear cutting to your exact needs.

Your inquiry is invited

ACME GEAR COMPANY

KALLAY GEARS
KALLAY GEAR WORKS
27th STATE ST. EXT. BRIDGEPORT 3, CONN.

Spur—Helical
Herringbone—Sprockets
3/16 Pitch Sprockets

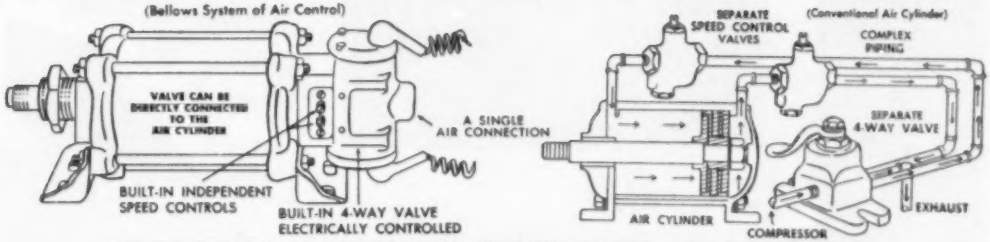
CAMS
BLAIR TOOL & MACHINE CORP.
119-06 15th AVENUE COLLEGE POINT, L.I., N.Y.

BILGRAM
BEVEL GEARS
Straight — Spiral Teeth

ALL TYPES
ALL MATERIALS

BILGRAM GEAR & MACHINE WORKS
1217-35 Spring Garden, Philadelphia, Pa.

Air control system designs being changed by success of low voltage solenoid "triggers"

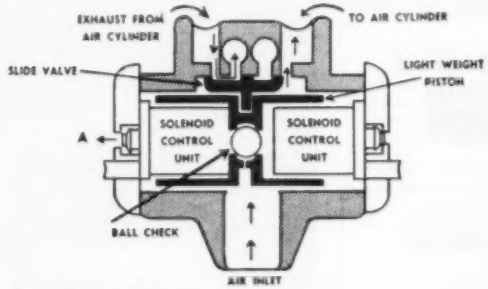


COMPARE EFFICIENT AND COMPACT BELLOWS AIR CONTROL SYSTEM WITH CONVENTIONAL METHOD

The development by The Bellows Company of a low voltage electrically controlled air valve has resulted in major design changes in equipment using air operated movements. The Bellows Electroaire valve, hardly as big as a package of king size cigarettes, does the job of power solenoid operated valves ten to twelve times its size.

The Bellows Electroaire Valve uses the air it controls to do the actual work of shifting the valve. The tiny 8-volt solenoids serve merely as "triggers" to release and direct the full force of the incoming high pressure air.

As shown in the illustration below, when high pressure air enters the valve, it fills the entire valve chest, exerting equal pressure on both ends of the small stainless steel piston. A momentary electric current sent to one of the two sealed solenoid control units draws the plunger away from the end cap for a fraction of a second, permitting high pressure air to escape to the outside. The check ball is drawn tightly against its seat. All of the incoming high pressure air on the opposite side is thus directed against one side of the small piston, shifting the valve. Energizing the opposite solenoid control unit reverses the valve.



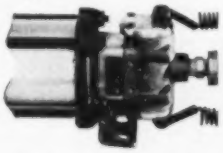
WHY THE LOW VOLTAGE?

Since the incoming air pressure does the work of shifting the valve, only a small amount of energy is required to move the solenoid plungers. 8 volts prove ample. Since the electrical contact is only momentary, and since the solenoid control units are located in the air stream, a natural coolant, heat is not a problem. In fact, the solenoid control units are guaranteed against burnout.

The low voltage simplifies wiring, does away with the necessity of expensive and bulky conduit, terminal blocks, and relays; and low voltage provides assured electrical safety for operator and machine.

BUILT IN SPEED CONTROLS MAKE THE ELECTROAIRE VALVE A COMPLETE "PACKAGED" AIR CONTROL UNIT

In conventional air cylinder practice, control of piston rod speed can only be obtained by inserting separate speed control valves in the air lines leading from the two cylinder ports to the remote air control valve. In the Electroaire valve two independent speed control regulators are built right into the valve itself, thus not only eliminating the extra valves but the extra piping as well. The Electroaire Valve is fast — will operate at speeds in excess of 2000 movements a minute, far beyond the capacity of any air cylinder with which it may be used.



STANDARD AS A BUILT-IN FEATURE ON ALL BELLOWS BEM AIR MOTORS OR AS A SEPARATE AIR CONTROL FOR ALL MAKES OF STANDARD AIR CYLINDERS

The Electroaire Valve is standard equipment on all Bellows Air Motors and other Bellows "Controlled-Air-Power" Devices arranged for electrical control. It is also available with an adapter mounting bracket for use with any standard air cylinder of suitable capacity. Three port sizes, ¼", ⅜" and ½" cover air cylinder bores from 1" to 4½".

PROVED IN OVER 60,000 INSTALLATIONS

More than 100,000 Electroaire Valves are now in use in more than 60,000 separate installations. Many Electroaire valves have established operating records of twenty to thirty million cycles without maintenance of any kind.

"EXPLOSION-PROOF" MODELS PERMIT SAFE USE OF ELECTRICALLY-CONTROLLED AIR POWER IN HAZARDOUS LOCATIONS

The "explosion-proof" Model of the Electroaire Valve meets fully requirements of the National Wiring Code of The National Board of Fire Underwriters for wiring in hazardous locations. All electrical connections are fully enclosed in a sealed cast bronze housing.

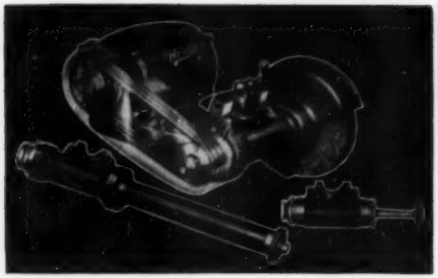
MAY WE SEND YOU THIS GROUP OF CASE HISTORIES

showing typical installations of The Bellows Electroaire Valve? Photographs, wiring diagrams, cost and production data. Free on request. Write Dept. AM-852, The Bellows Co., Akron 9, Ohio.

The Bellows Co.

AKRON 9, OHIO

1348



YOUR LATHE
is a precision Grinder!

Either internal or external—your boring mill, too—and planer and other machine tools in your shop, are now capable of precision grinding of rolls, surface plates, bearings, journals, mandrels, cutters, etc. They merely require a HISEY Wide Range Precision Grinder attached to their regular tool holding fixture.

Built in a number of sizes and types, they are adaptable for production work as well as the thousand and one odd grinding jobs which crop up in every shop and tool room.

The V-Belt drive affords the most efficient and economical speed and permits rapid speed changes as required.

Driven by constant speed motor, a steady, uniform speed is maintained as required for best results.

Catalog 72AA on Request

Hisey THE HISEY-WOLF MACHINE CO.

Just Published

A cost-cutting manual for help in CHOOSING, DESIGNING, GRINDING, and USING cutting tools

Here is a highly practical treatment of the many problems involved in selecting, designing, grinding, and using machine cutting tools. Easy to understand, and written in shopman language, the book shows how to use the single-pointed cutting tool more efficiently and economically, while consistently turning out better work. The book gives the kind of down-to-earth help that reduces wasteful tool breakage, cuts down on expensive tool inventory, and makes for increased machine output.

DESIGN and USE of CUTTING TOOLS

By LEO J. ST. CLAIR
Cutting Tool Consultant
420 Pages, 179 illus., 60 tables, $7.00

ALL the material in the book is based on the author's wide interest and experience in the field of cutting tools. And every one of the ideas is presented in clear, usable fashion—in a way that can work benefits in your shop from the very start. Functions of the various tool angles—side and end relief, angle of clearance, side and back rake—are treated in detail to help you design better tools. Good and poor qualities of different tool materials are outlined—shop-tested, money-saving information on choosing the right material for any job. Chip formation and chip control, and ways of maintaining an efficient cutting edge are thoroughly discussed. And, for completeness, there is considerable material on grinding tools, and selecting the best cutting speeds and feeds.

JUST A FEW OF THE SCORES OF HELPS

- Factors controlling cutting tool performance
- Recommended side relief angles
- What the side rake depends on
- Recommended size for the nose radius
- When the edge should be stoned off
- Permissible depth of wear land
- How to produce a fine cutting edge

For your "tough" machining jobs, there are more than 50 ideas for increasing tool life, and over 20 hints for strengthening the cutting edge. The many illustrations, charts, and tables make the book easy to follow, and provide valuable data in convenient form.

READ THIS BOOK 10 DAYS FREE

McGRAW-HILL BOOK COMPANY, Inc.
330 West 42nd St., New York 36

Send me St. Clair's DESIGN AND USE OF CUTTING TOOLS for 10 days' examination on approval. In 10 days I will remit $7.00 plus a few cents for delivery, or return the book postpaid. (We pay for delivery if you remit with this coupon —same return privilege.)

(Print)
Name
Address
City Zone State
Company
Position A-8-4-52

This offer applies to U. S. only.

From the *American Machinist* Library of *Tips for Top Shop Men*

SABOTAGE is a greater potential danger for most plants than bombing. Have you taken any precautions to guard against it?

MORALE isn't built in a crisis; it's built beforehand. The crisis only tests it.

THERE'S an old saying that "If you want to be big, you've got to look big." Nobody likes a fourflusher or a fop, but everybody has been trained from childhood to expect a leader to look like one. Company policy can't earn respect on the major things either, if it is small on the minor things. Don't make your company look small.

there's real ventilation— 24 air channels in every H-VW-M Ruff-L-Buff!

Evenly distributed ventilation, too. That means air-cooled operation even under severest use—more pressure without burning—faster cut—more composition mileage—and longer life for the buff. Air rushes into those extra large holes at the center, circulates right through the wheel, and escapes at the face. This constant flow of air—plus the fanning effect of the ruffles at the face—*eliminates excessive heat.*

Now take a look at the rest of these features: There's an extra safety factor in the rugged steel ring that anchors the cloth at the center; every buff is perfectly balanced; and that exclusive H-VW-M Red-E-To-Use Face is all set to take composition without raking or truing. Ruff-L-Buffs are available in a wide variety of types and weights for any application—to do a *better* buffing job for *you.*

Top quality buffs are just one of many results of over eighty years of constant electroplating and polishing development—a continuing policy summed up in H-VW-M Platemanship . . . your working guarantee of the best that industry has to offer—not only in buffs—but in every phase of plating and polishing.

PLATEMANSHIP

For full information on Ruff-L-Buffs as well as all H-VW-M buffs ask for Bulletin B-100.

Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

HANSON-VAN WINKLE-MUNNING CO., MATAWAN, N. J.
PLANTS AT: MATAWAN, N. J. • ANDERSON, INDIANA
SALES OFFICES: ANDERSON • BOSTON • CHICAGO • CLEVELAND
DAYTON • DETROIT • GRAND RAPIDS • MATAWAN • MILWAUKEE
NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH
ROCHESTER • SPRINGFIELD (MASS.) • STRATFORD (CONN.) • UTICA

H·VW·M

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

Tell Us Your Production Problems . . . We'll Help You Solve Them

"LOGAN" HYDRAULIC CYLINDERS

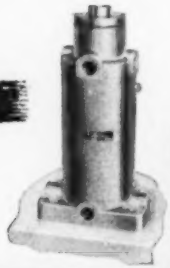
SAVE TIME EFFORT MOTION

Here's fast-acting, positive controlled power for all types of industrial applications. . . .

LOGAN 750 SERIES

ROTATING TYPE—Seven standard sizes from 3" to 14" diameter bore. Larger sizes special to order. Maximum operating pressure 500 p.s.i.

NON-ROTATING TYPE—Eight standard sizes from 2" to 8" diameter bore. Larger sizes special to order. Maximum operating pressure 750 p.s.i.



LOGAN ROTOCAST® SERIES

7 STANDARD MOUNTINGS

Sizes from 2" to 8" bore; any length stroke up to 8 feet. Other bores and lengths are special. Four piston rod end types. Operating pressures to 1500 p.s.i.

FLUID POWER SPECIALISTS SINCE 1916

Logan Manufactures 6,975 Standard Cataloged Items

Free Catalog On Request

- **AIR CONTROL VALVES** CATALOG 100-4
- **AIR CHUCKS** CATALOG 70-1
- **AIR CYLINDERS** CATALOG 100-1
- **AIR and HYDRAULIC PRESSES** CATALOG 51
- **COLLET GRIP TUBE FITTINGS** CATALOG 44
- **HYDRAULIC CONTROL VALVES** CATALOG 200-4
- **HYDRAULIC CYLINDERS** CATALOG 200-2; ALSO 200-3
- **HYDRAULIC POWER UNITS** CATALOG 200-1
- **SURE-FLOW COOLANT PUMPS** CATALOG 62

Let Logan Engineers help you design your Air and Hydraulic Circuits.

Logan SAVES TIME • EFFORT • MOTION

Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC. 818 Center Ave. • Logansport, Ind.

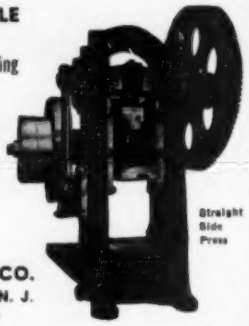
STRAIGHT SIDE SINGLE CRANK PRESSES

for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



Straight Side Press

ZEH & HAHNEMANN CO.

NEWARK N. J.

180 Vanderpool Street

LUERS Patented Cutting Off Tool Holders - Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY

Manufactured By

J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

PRECISION DIES

CAN BE ENGRAVED BY ACROMARK SKILLED ENGRAVERS AND MODERN ENGRAVING EQUIPMENT.

The ACROMARK Company

WE DO OUR OWN HEAT TREATING

7-13 MORRELL ST., ELIZABETH 4, N. J.

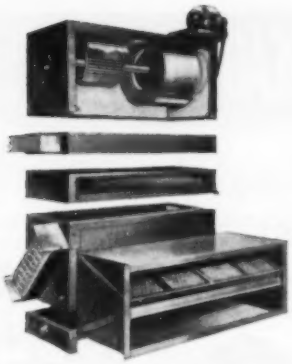
B & RB PRECISION BEARINGS

Are selected for dependability and greater capacity. Standard sizes are carried in stock.

Write for our general catalog.

THE BALL AND ROLLER BEARING CO.

DANBURY, CONNECTICUT



Carrier System Weathermaker, showing sectionalized construction. Note accessibility of each functional component. Piping connections can be made from either side.

What goes into good air conditioning?

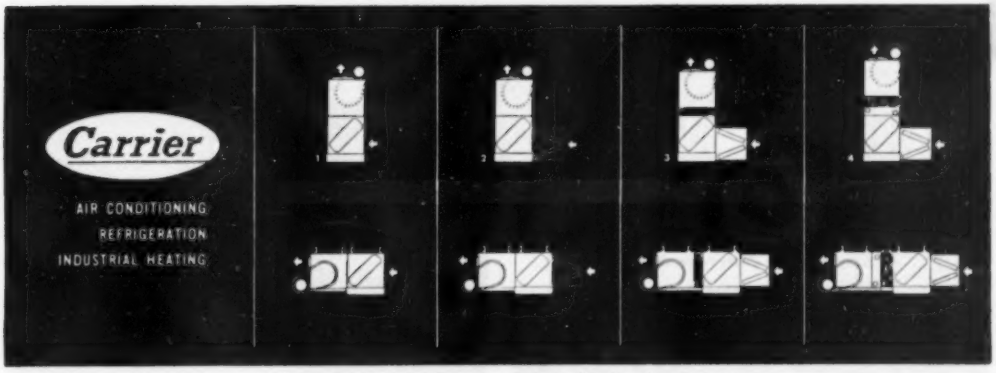
Good equipment, naturally. But we think that's only half the story. The other half is good dealer service.

For example, take our System Weathermaker. Its unique sectionalized construction (demonstrated below) permits a wide variety of unit combinations to meet individual job or space requirements.

Good? There's nothing else like it for industrial air conditioning applications.

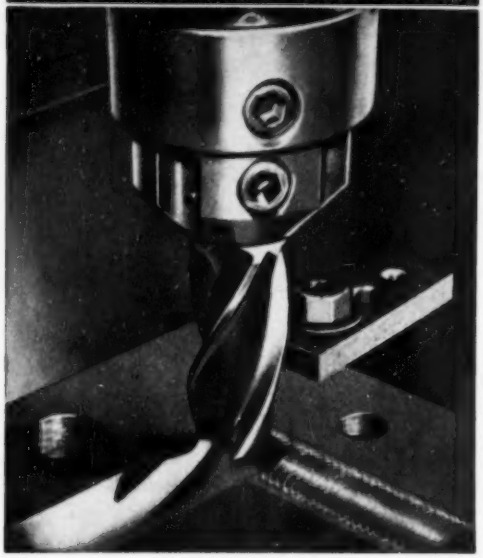
And here's where the Carrier dealer comes into the picture. He *knows* air conditioning. He knows how to use this sectionalized construction in terms of your needs. His experience plus our product give *you* the kind of air conditioning that's easily serviced and technically suited to the job.

Remember, there's a full line of Carrier products, all matched in size and performance to work together. So whatever your air conditioning or refrigeration needs, your Carrier dealer is the man to call in. He's listed in the Classified Telephone Directory. Or write Carrier Corporation, Syracuse 1, New York.



1. Arrangement includes fan section, cooling coil section, base pan section.
2. All sections from No. 1 with addition of filter section.
3. All sections from No. 2 with addition of heating coil section.
4. All sections from No. 3 with addition of a by-pass section.

YESTERDAY'S PIONEER - - - TODAY'S LEADER



NEW HEAVY DUTY END MILLS and HOLDERS

(Both are Stock Items)

● Look at this rugged 2" diameter Weldon end mill with 4" long flutes which made a 2½" deep cut in a solid block of die steel—4140 steel heat treated to 260 Brinnell. The feed was 1½" per minute, and the material was removed at a rate of 7½ cubic inches per minute. The shank of this end mill is 2" in diameter.

This HEAVY DUTY Weldon end mill is held by a new-style end mill holder which bolts securely on to the nose of the milling machine spindle. The holder, located by a centering plug, is driven by two drive keys on the spindle nose.

For top performance and sturdy long life in end mills—large or small—look to Weldon.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you

SEND FOR LATEST CATALOG NO. 10

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

THREAD DRESSERS . .

Durable and Accurate

Precision selects the finest crystals.

PSM P.S.M. matrix holds diamonds firmly. It is tailor made to hold small diamonds.

Precision uses "Centerscope" to turn tools concentric with diamond points.

All thread dressers are inspected on an optical comparator before shipping.

#142A	J & L #NX551-2	3.55
#142B	J & L #NX574-75	3.55
#143	Excello #48-4105	4.15
#145	Excello #48-4105-1	4.15

ORDER TODAY! Immediate Delivery. Shipped from Stock! Discount for quantity orders. Send for free literature.

PRECISION DIAMOND TOOL CO.
102 S. GROVE STREET POT ELGIN, ILLINOIS

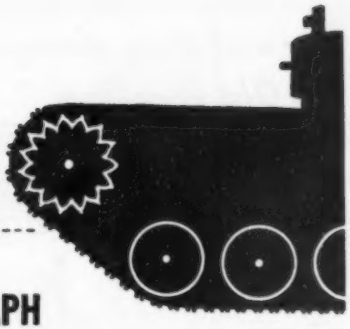
Precision power presses and feeds in a wide range of types and sizes to meet every requirement.

See Pages 26-27 June 23rd, American Machinist

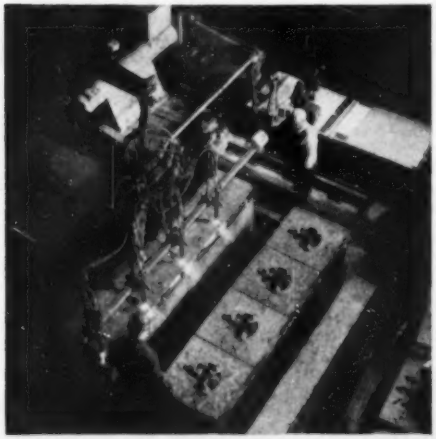
THE V & O PRESS CO. *Division of Emhart Mfg. Co.* HUDSON, N. Y.

American Machinist helps you sell

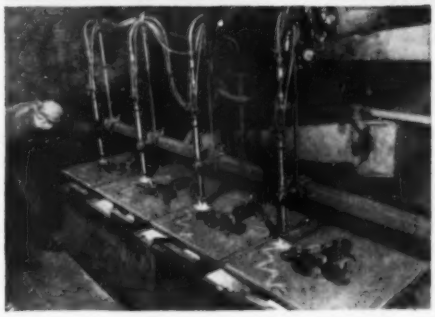
64 sprockets per day



AIRCO FOUR-TORCH TRAVOGRAPH CUTS FINISHED SPROCKETS!



The No. 50 Travograph in action. Inner circle and straight line cuts are done on rear table. The Electronic Tracer guides the arm movements automatically by following a low-cost outline drawing.



Outside pattern cut in progress on front table. Smooth, sharp-edged cuts make finish grinding unnecessary.

How to turn out tank sprockets to fit defense demands was quickly solved by the Otis Elevator Company. Installation of an electronically-guided Airco No. 50 Travograph Gas Cutting Machine in their Yonkers, New York plant was the answer.

Located next to the steel plate delivery entrance, Otis workers make quick work set-ups on their No. 50 Travograph, set a low-cost outline drawing under the Travograph's electronic tracer, and let the pantagraph arms guide the torches to work completion.

Torches are equipped with solenoid valves, operated by means of remote control switch which shuts gas off at work completion preventing contour-destroying notches . . . losing only torch gas — keeping hose lines full and instantly ready for next operation.

For your next production-run, large-parts job, where a machine-free finish is required on parts of any shape, it will pay you to consider the No. 50 Travograph. Whether you're cutting from plates, slabs, billets, or forgings, here is a precision machine that will cut identical parts on a profitable, quantity-production basis.

To obtain details about the Airco No. 50 Travograph for your operations, contact your nearest Airco office. Or just write and ask for Catalog 7, The No. 50 Travograph Gas Cutting Machine. Address: Advertising Department, 60 East 42nd Street, New York 17, New York.

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

AN AIR REDUCTION PRODUCT

AIRCO®

DEALERS AND OFFICES IN PRINCIPAL CITIES

AIR REDUCTION

AIR REDUCTION SALES COMPANY • AIR REDUCTION MAGNOLIA COMPANY • AIR REDUCTION PACIFIC COMPANY

REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL

DIVISIONS OF AIR REDUCTION COMPANY, INCORPORATED

"— and they chopped down the Old Pine Tree."

Woodsmen Use Marking Devices!

When a forester indicates a tree is to be cut by the lumberjack he usually paints a mark just above the ground and another about breast-high, indicating it is to be cut for lumber purposes. If the tree is diseased he usually marks it with an X or other suitable device, indicating that it is to be cut for destruction or firewood.

CADILLAC MARKING DEVICES

are Designed for ALL MARKING PURPOSES

Whatever your requirements, from small Hand Stamps to Pneumatic, Hydraulic or especially created Marking Machinery, CADILLAC STAMP COMPANY stands ready to supply or design and build to meet your needs.

INTERCHANGEABLE TYPE and TYPE HOLDER SETS

The faces of CADILLAC Steel Letters and Figures combine a high degree of hardness with toughness, insuring especially long life. All CADILLAC Marking Type and the recess in Type Holders are made in standardized dimensions. This means that type will fit interchangeably in hand holders, marking machine holders or punch press holders designed for the size type specified. Due to the precision adhered to in manufacturing, they will when assembled in any holder make impressions in perfect alignment.

HEAVY BEVEL HAND STAMPS
CADILLAC Heavy Bevel Letters and Figures combine a high degree of hardness with toughness, insuring exceptionally long life.

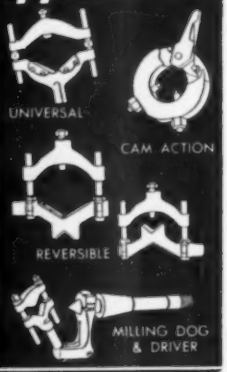
HAND STAMP SYMBOLS
A system of distinctive symbols for inspection and confidential markings. Write for Symbol Chart.

CADILLAC STAMP CO.
17311 RYAN ROAD • DETROIT 12, MICH
3000 IRVING PARK • CHICAGO 18, ILLINOIS

RED-E

GRINDER-MILLING MACHINE DOGS

for EVERY application



● Special exclusive RED-E features mean unmatched versatility for ***GREATER SAVINGS*** in time, labor, money. Quick change-overs, simple installation, finger-tip control, perfect balance, accuracy and ***adjustability*** assure greater economy, micro-precision and stepped-up production that you can't afford to pass up!

Complete range of sizes!
Send for the RED-E Bulletin, now!
GRINDER DOG *Specialists*
Since 1908

RED-E TOOLS **READY TOOL COMPANY**
548 Ironiston Ave. Bridgeport 5, Conn.

Of course not — because it doesn't pay. Likewise metal cutting machines less modern than the spin-dry washer do not pay.

Your machine tools were bought for one purpose — to make parts at a profit. Put modern RACINE Power Saws into your production line to increase output and improve the quality on all cut-off work. These machines save material and man-hours. They operate with low maintenance and without down-time. Costs come down as your production goes up.

BUY DEFENSE BONDS

A range of models and all capacities from 6" x 6" to 20" x 20" meet every need. Single purpose and fully automatic bar-feed units save money. Write today for free production estimates on your own specific jobs.

RACINE HYDRAULICS & MACHINERY, Inc.,
2051 Albert St., Racine, Wis.

RACINE **RACINE** STANDARD FOR QUALITY AND PRECISION

BOKOMAT

SEMI-AUTOMATIC MULTI-SPINDLE DRILLING MACHINE

FOR MAXIMUM PRODUCTION

Continuous working cycle is automatically controlled . . . Loading and unloading workpieces are only operations . . . Speedy set-ups—drilling heads and fixtures are easily aligned by guide pins and bushings . . . Drilling, reaming, tapping and countersinking operations performed simultaneously.

DESIGN FEATURES

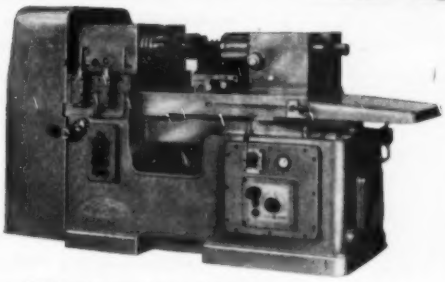
Extremely Rigid—Drilling head is mounted on two columns . . . Torque is absorbed by the twin columns . . . Amply powered for effective tool use . . . Rapid approach and withdrawal of drilling head.

MADE IN TWO SIZES

- BKM-340—13⅜" between pillars—16¾" between drilling head and table—mechanical feed.
- BKM-450—17¾" between pillars—23⅝" between drilling head and table—hydraulic feed.

BKM-340 Multi-Spindle Drilling Machine with Mechanical Feed

WRITE FOR CATALOG B-21e OR SEND PART DRAWINGS FOR DETAILED QUOTATION



Drebomat II Semi-Automatic Boring and Turning Machine

DREBOMAT

SEMI-AUTOMATIC BORING AND TURNING MACHINE

A universal or single purpose machine that can be tooled for various operations.

BORING

High Precision • High Surface Finish
Taper • Copy • Cross • Multi-Spindle
TURNING • FORMING • RECESSING
PARTING • MILLING

Machining can be done on stationary or rotating workpieces . . . Semi-automatic working cycle controlled by hydraulic system . . . Constant cutting speeds maintained by electronic controls.

MADE IN TWO SIZES

- Drebomat I
  for medium sized workpieces
- Drebomat II
  for heavy and large workpieces

WRITE FOR CATALOG B-20e OR SEND PART DRAWINGS FOR DETAILED QUOTATION

VISIT COSA'S NEW YORK SHOW ROOM

See in operation the Drebomat, Bokomat, and the Bekoma Vertical Plano Milling Machines and Bekoma Turret Drilling Machines.

COSA CORPORATION

405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

Precision Tap Sharpening and Its Importance To You

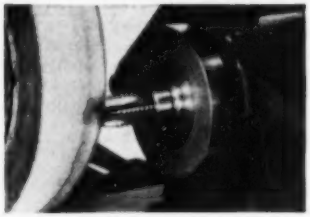
Precision tap sharpening is helping many manufacturers reduce tap costs up to 75%. It also enables them to get greatly increased production from each tap and makes possible a sharp reduction in tap breakage. It can benefit you, too!

WHAT PRECISION SHARPENING IS

Precision tap sharpening is a method of controlling the accuracy of tap indexing (keeping cutting edges uniform and evenly spaced), controlling the rake angle of cutting edges and providing uniform chamfers. These results enable a tap to cut more accurately and uniformly for a much longer period of time than is possible when the precision sharpening method is not used.

THE IMPORTANCE OF BLAKE EQUIPMENT

Until the introduction of Blake tap sharpening equipment a few years ago, no practical method was available to realize the benefits of precision sharpening. The Blake Flute Grinder and Blake Chamfer Grinder are recognized today as the only practical means of putting precision sharpening into actual operation.



TAP IN POSITION FOR PRECISION SHARPENING

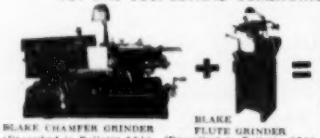
Photograph shows four-fluted tap in correct position for precision chamfer grinding on Blake Tap Chamfer Grinder.

SEND FOR MORE FACTS NOW!

A recent *Machinery* article, "Why Taps Should Be Sharpened Precisely", contains additional information on this interesting and profitable subject. Write us for your free copy. Bulletins about both Blake machines are also available on request.

IT'S A FACT! YOU CAN REDUCE YOUR TAP COSTS 50 to 75% by installing Blake tap sharpening equipment and sharpening your taps as you do other metal cutting tools.

PUT THIS COST-CUTTING COMBINATION TO WORK FOR YOU NOW!



BLAKE CHAMFER GRINDER (Described in Bulletin 551)

BLAKE FLUTE GRINDER (Described in Bulletin 651)

ACCURATE, TRUE-CUTTING TAPS
LESS TAP BREAKAGE
600% MORE PRODUCTION PER TAP
UP TO 75% REDUCTION IN TAP COSTS

Write for details about both machines!

EDWARD BLAKE COMPANY 434 CHERRY ST., WEST NEWTON 65 MASSACHUSETTS

BLACK DIAMOND PRECISION DRILL GRINDER . . . WALTHAM CUTTER SHARPENER . . . SURFACE FINISH STANDARDS

From the *American Machinist* Library of *Tips for Top Shop Men*

GET to know your people *before* you have to get tough with 'em. It's poor policy to make their acquaintance by bawling 'em out. Introduction by insult is no longer a successful management routine.

THE old Army slogan, "If it moves, salute it; if it doesn't, pick it up; if you can't pick it up, paint it," can well be adapted for plant use by changing "salute" to "guard" and "paint" to "oil."

How efficient is YOUR shop?

Over 42 per cent of metalworking production equipment is now over ten years of age . . . 19 per cent of it was bought more than 20 years ago!

This means that there is more over-age and obsolete production equipment operating in metalworking shops now than in 1945, and the rate of obsolescence is growing.

How about your shop? Are you equipped adequately with the modern, high-efficiency machinery and equipment which alone can produce the better products that cost *less to buy* which everybody wants? How does your shop compare with those of your competitors, and with metalworking shops generally?

You can find out quickly by writing for a copy of the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment. Here are all the facts on the age and number of 155 major types of production equipment, operating in 15 manufacturing divisions and 25 major production areas. Price: $2.00 per copy.

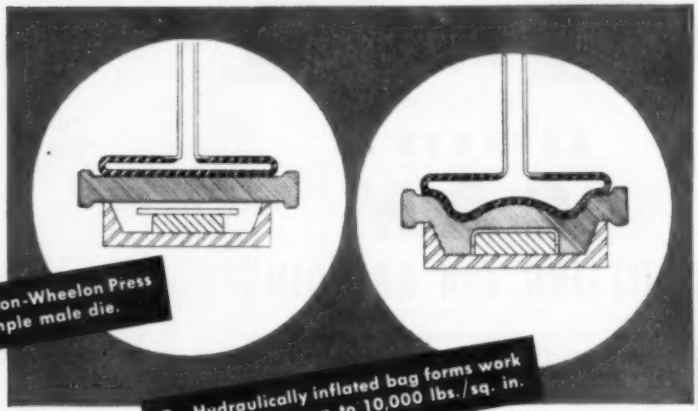
American Machinist

Reader Service Department

McGRAW-HILL BUILDING
NEW YORK 36

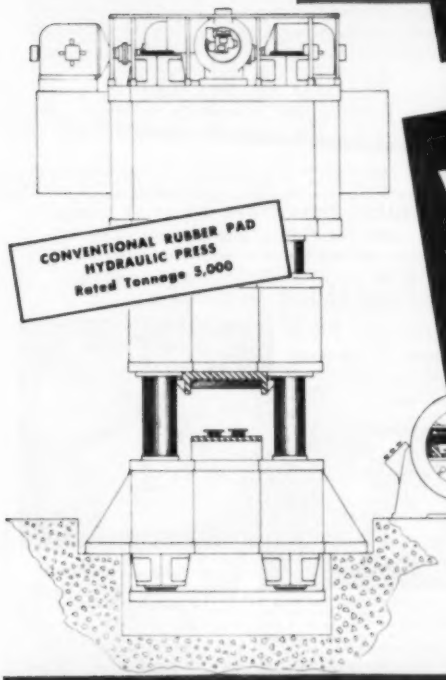
LOOK AT THIS *NEW METHOD* OF RUBBER PAD FORMING!

- Completely Revolutionary
- Costs Less
- Eliminates Hand Work
- Simple Male Die Only
- No Set-up Time



1. Blank inserted in Verson-Wheelon Press over inexpensive, simple male die.

2. Hydraulically inflated bag forms work at pressures up to 10,000 lbs./sq. in.

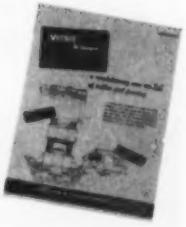


CONVENTIONAL RUBBER PAD HYDRAULIC PRESS
Rated Tonnage 5,000

DONE BY THIS LITTLE VERSON-WHEELON PRESS

Rated Tonnage 10,800

With this little press, heavy gauge metal is completely formed—it will even make perfect return flanges! Compare it with the big, expensive conventional rubber pad forming press at the left which seldom turns out pieces not requiring further hand forming.



GET THIS BULLETIN!

. . . Complete information of the Verson-Wheelon Press and the revolutionary new rubber pad forming process. Ask for Bulletin VW-52.

Originators and Pioneers of Allsteel Stamping Press Construction

VERSON ALLSTEEL PRESS COMPANY

9316 South Kenwood Avenue, Chicago 19, Illinois — So. Lamar at Ledbetter Dr., Dallas Texas

A VERSON PRESS FOR EVERY JOB FROM 60 TONS UP

MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING

KUX

EXPERTS AT

CAM

CUTTING and GRINDING

The largest, most completely equipped plant in the country devoted to CAM cutting and grinding is at your service. 25 YEARS of experience in making special cams for thousands of companies has made us experts at cam cutting and grinding. Our facilities and equipment, finest in the country, permit us to manufacture any style or size Cam, Geneva Motion or Scroll Plate in quantities of 1, 10 or 10,000. Accuracy can be maintained to split thousandths, and surfaces to micro-finishes. Send us specifications or blueprints and we will be glad to submit a detailed quotation on your requirements.

KUX MACHINE COMPANY

6725 NORTH RIDGE • CHICAGO 26, ILLINOIS

M&M giant keyseaters

M & M Giant Keyseaters, built in a range of sizes, speedily and accurately cut interval keyways or splines in the bores of pulleys, gears, fly wheels or any other machine part. Special fixtures and cutters are available for unusual shaped keyways and taper work. Send us your problems.

MITTS & MERRILL

104 Holden Street • SAGINAW, MICHIGAN

CHUCKS THAT HAVE WHAT IT TAKES
and Yet Priced Unbelievably Low

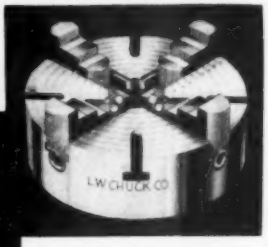
Our business has been built on selling fine chucks for less money.

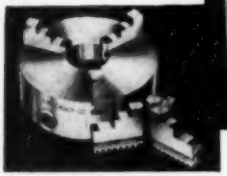
L-W 5" UNIVERSAL 3-JAW LATHE AND SCREW MACHINE CHUCK

AN UNBEATABLE VALUE AT ONLY **$30.22**

RUGGED • ACCURATE

Fits any lathe having 1⅛"—8 thread spindle. Using back adapter plate, it mounts on any size or type.





Fits L-W 6½" SD Dividing Head. 3 tough hardened steel pinions. Two sets of accurately cut hardened and ground steel reversible jaws. Cast semi-steel body ground to fine finish.

		Weight	Jaw Width
5"	$ 30.22	8 lbs.	⅝"
6½"	$ 42.04	18 lbs.	¾"
7½"	$ 52.80	25 lbs.	⅞"
10½"	$110.61	70 lbs.	1"

L-W 4-JAW CONVENTIONAL TYPE HEAVY DUTY INDEPENDENT LATHE CHUCKS

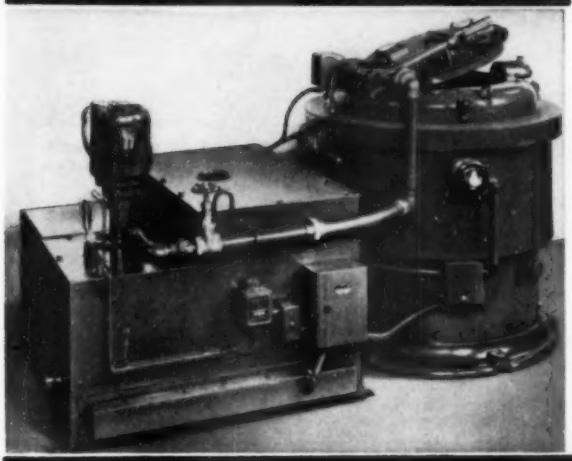
		Weight	Jaw Width
6"	$ 21.56	11½ lbs.	⅝"
8"	$ 27.41	20 lbs.	¾"
10"	$ 59.92	55 lbs.	1¼"
12"	$ 68.60	75 lbs.	1¼"
14"	$ 79.01	91 lbs.	1¼"
16"	$104.60	140 lbs.	1½"
18"	$137.96	180 lbs.	1½"

Order from your industrial supply distributor or order direct, giving name of your distributor.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 25 SO. ST. CLAIR ST. TOLEDO 4, OHIO

CONTROLLED IMPREGNATION by the BARRETT "HYDEWA" Centrifugal Process offers many advantages



The Centrifugal Process is limited in application only to the size of the articles that may be rotated in fair balance in the revolving bowl. Coils, condensers, transformers, braiding cotton insulated wire, paper tubes, pressboard spacers, rawhide and bristles, are but a few of the many typical products now being processed in Barrett Impregnators. Many products heretofore considered impractical for satisfactory impregnation by other methods have been successfully handled.

The Barrett Method assures fast production, by reducing the customary hours to minutes, high penetration, with controlled impregnation, also positive expulsion of air from the articles being impregnated.

Basic units are self-contained, direct motor driven. Special arrangements and supplemental equipment also provided.

Submit your problem and samples for test and recommendations.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

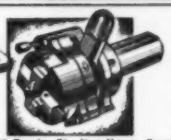
EISLER JIG BORING • CAMS

A SPECIALIZED CAM MILLING SERVICE . . JIG BORING SPOT WELDING . . CONTRACT PRODUCTION . . EXPERIMENTAL DEVELOPMENT

EISLER ENGINEERING CO., Inc.

Chas. Eisler, Pres.

H&G Insert Chaser DIE HEADS



famous for accuracy and straightness of threads, low chaser costs, less downtime, more pieces per day.

THE EASTERN MACHINE SCREW CORP., 70-46 Barclay St., New Haven, Conn.

Pacific Coast Representative: *A. C. Berheringer, 334 N. San Pedro St., Los Angeles, Calif.* Canada: *F. F. Barber Machinery Co., Toronto, Can.*

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

9025 VAN WYCK AVENUE
JAMAICA, NEW YORK

TELEPHONE: JAMAICA 6-4090

WALTHAM SUB-PRESSES...

. . . for precision work

Arch Sub-Press

The cylindrical plungers in the Waltham Sub-Presses slide in babbitted bearings. This bearing is tapered on the outside and can be forced downwards, thus reducing the inside diameter to fit the plunger when the latter becomes worn through use. Exact alignment and constant precision can be maintained throughout the life of the die. Write for information about the nine sizes.

Overhang

WALTHAM MACHINE WORKS
HIGH STREET, WALTHAM, MASS.

There's a Walker Magnetic Chuck for Every Known Application . . .

For sixty years, Walker has specialized in the designing and production of magnetic holding devices. Today, Walker produces a complete line of magnetic chucks and designs special chucks to meet unusual holding problems.

●

Standard Electro and Permanent Magnetic Chucks . . . Vacuum Chucks . . . Special Applications for various holding problems . . . Demagnetizers . . . Magnetic clutches.

Original Designers and Builders of Magnetic Chucks

O. S. WALKER CO. Inc.

WORCESTER 6, MASSACHUSETTS

Feeding Machine Screws

- To Electronic Length Sorter
- Single File
- In Oriented Position
- Automatically

SYNTRON

"Vibra-Flow"

PARTS FEEDERS

Let controlled vibration feed your small, medium or large parts . . . single file . . . in oriented position . . . at variable rates . . . without damage . . . to your inspection and counting devices and other automatic processing equipment.

Catalog data upon request. Or send details of your problem along with sample parts to . . .

SYNTRON CO.

311 Lexington Ave. Homer City, Pa.

10 Good Reasons

why YOU should use NATIONAL Keyseating Millers on your next job

They will mill keyseats:

- in one cut.
- in offset holes.
- that are straight.
- with parallel sides.
- partly through holes.
- for interchangeable parts.
- without clamping the work.
- of standard width and depth.
- in holes that are closed at one end.
- where keyseating machine can't reach.

national

MACHINE TOOL CO.

CINCINNATI 22, OHIO

WRITE TODAY

For Catalog No. 17 complete, handy size

Over 85% of the torque wrenches used in industry are

STURTEVANT TORQUE WRENCHES

Read by Sight, Sound or Feel.

- Permanently Accurate
- Practically Indestructible
- Faster—Easier to use
- Automatic Release
- All Capacities

. . . in inch ounces . . . inch pounds . . . foot pounds (All Sizes from 0-6000 ft. lbs.)

Every manufacturer, design and production man should have this valuable data. Sent upon request.

P.A. STURTEVANT CO.

Get fast production speeds with CHASE® BRASS SHEET or STRIP

The high ductility and malleability of Chase brass sheet and strip make fast production speeds possible. You'll save time and money because deep draws can be made in one operation.

Chase sheet and strip come to you with clean surfaces . . . and that means lower plating and polishing costs. We make certain that all Chase sheet and strip are free from oxides, dirt, grease and oil.

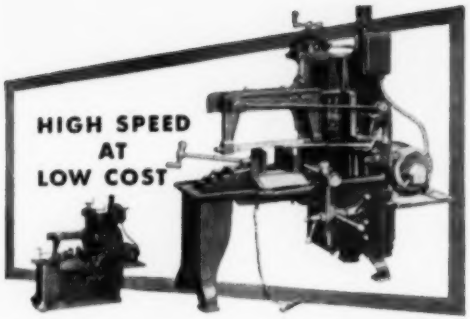
Careful checking of gauge, surface and temper means you get the kind of brass or copper sheet or strip you need for your product. It pays to call your Chase jobber or your nearest Chase mill warehouse.

Chase® BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(Trains office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	



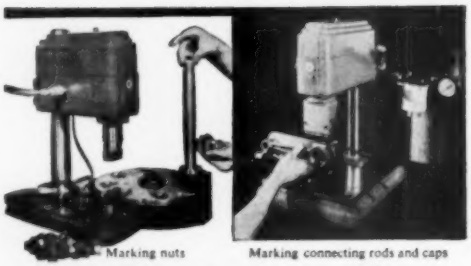
For tool room, stockroom, or maintenance shop, this 6" x 6" capacity hack saw is ideal when you want speed, accuracy, and economical operation at lowest possible investment.

Embodies similar design principles and features of MARVEL heavier duty production saws. Its shaper-link action that provides quick return stroke, and its heavy pressure screw feed are two exclusive MARVEL features that provide FASTER cutting than can be obtained with any other metal saw in its price class.

Single speed, 2-speed, and 4-speed models are available, to suit all types of applications where materials of different hardness and alloy characteristics are to be cut. Cabinet base or open-leg base are optional.

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO.
"The Hack Saw People"
5700 Bloomingdale Ave. Chicago 39, U.S.A.



Marking nuts — Marking connecting rods and caps

Mark More Parts per Minute

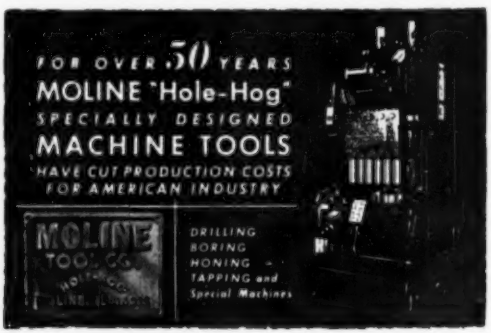
Whether your problem is the marking of nuts, bolts, connecting rods, axles, pots and pans or the branding of screw drivers, pencils, baseballs or ammunition belts—it will pay you to investigate the Automark. This automatic high-speed pneumatic marking machine needs no special jigs or fixtures for average work. Where holding devices are required several standard automatic fixtures are available. We'll gladly design and build special equipment. Write for Bulletin 712.

NEW Electric Typewriter marks metal name plates in one-fifth the time.

AUTOMARK
Automatic Marking MACHINE
Manufactured Exclusively By

AGENTS
Desirable territories open for responsible representatives. Write giving complete information, lines carried and territory covered.

DEFIANCE MACHINE & TOOL COMPANY
1920 South Vandeventer Ave. • St. Louis 10, Mo.

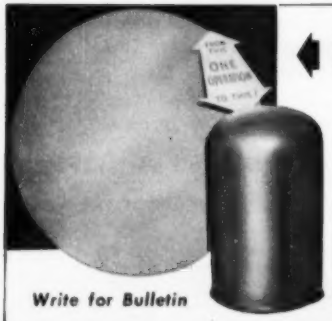


GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn, U. S. A.



Write for Bulletin

FROM A BLANK TO HALF-TANK SECTION

IN 20 SECONDS BY THE
SCHNELL PATENTED
DEEP DRAWING DIE PROCESS

● The Scaife Company—Weatherhead—Sheffield Steel Corp.—and numerous other concerns are enjoying low cost production with these Schnell patented Deep Drawing Dies.

This half-tank section, 14½ inch diameter by 24 inches deep, was drawn from a 38½ inch blank 0.105 inch thick in 20 seconds. Formerly these half-tanks required three drawing and two annealing operations with scrap running as high as 50%. Scrap has been reduced to 1% or less and production increased tremendously.

Advantages of this process include better metallurgical properties, less metal distortion and a more uniform wall thickness—resulting in a better product, in less time, at lower cost. For stamping or deep drawing operations with dies designed to meet your requirements consult Schnell.

SCHNELL TOOL & DIE CORP., *Salem, Ohio*

KEYSEATING
The Modern Way

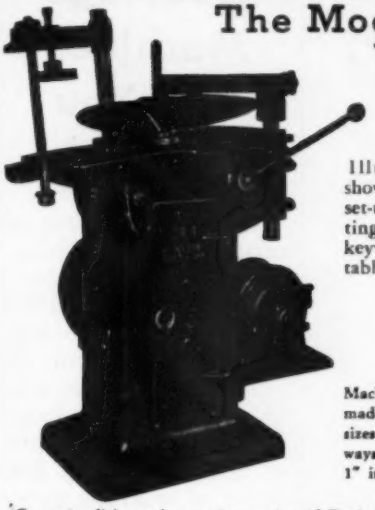


Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

an ACCO product

5 Important "ROCKWELL" Features

1. Totally enclosed, dirt and dust-proof "Zerominder" dial gauge. 2. Gripsel clamp screw for quick change and proper setting of penetrator. 3. All controls grouped conveniently. 4. Enclosed, easy-to-reach, variable speed dash pot. 5. Standardized weights. These features assure accuracy and ease of operation.

There are two models of WILSON "ROCKWELL" Hardness Testers, plus the TUKON for micro-indentation hardness testing. Write for information.

ACCO *"Trade Mark Registered*

WILSON MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE
230-B Park Avenue, New York 17, N. Y.

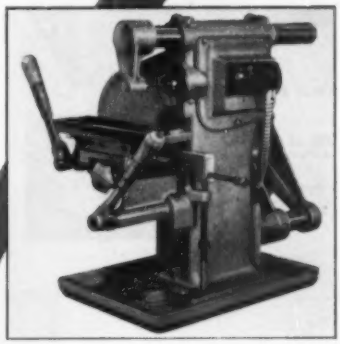
WILSON "ROCKWELL" and TUKON Hardness Testers

Why tie-up
BIG INVESTMENT MILLING MACHINES

with work that can be done quicker and easier on

BURKE
BENCH MILLERS

It is amazing how much miscellaneous and production milling can be shifted from large millers to rugged, accurate, economical Burke Bench Millers.



Complete data on hand-feed, power-feed and universal models and attachments sent on request.

Thousands now at work in production lines and tool, repair, development and school shops.

The Burke Machine Tool Co.
A Division of the U.S.-BURKE MACHINE TOOL CO.
BROTHERTON ROAD 6
CINCINNATI 27, OHIO

How to get
High Wear Resistance
in
Small Parts!

DIVERSIMATIC
CENTERLESS
GRINDER

Have you been afraid to heat treat small parts because of warpage? Have you been forced to use costly steels as a substitute measure for improving wear resistance?

DIVERSIMATIC *gives you the final answer* . . . now you can rough machine on automatics, heat treat and grind on a *centerless* grinder. The DIVERSIMATIC is built for *small* work (up to 1½" max.) It *removes* warpage, obtains tolerance and high microfinish simultaneously.

The wide variety of shapes and contours handled will amaze you and high production speed insures the economy you want!

ACCESSORIES: *Full line of infeeding, thrufeeding, automatic cycling.*

DELIVERY: *Just 8 weeks away—why wait?*

WRITE FOR NEW CIRCULAR!

Just off the press—6 illustrated pages. Sent free!

DIVERSIFIED METAL PRODUCTS CO.
5125 ALCOA AVE., LOS ANGELES 58, CALIF.

1.5"
Send your prints or sample blanks for quotation.
World's Largest Producer of
LOW COST, PRECISION
DIE CUT STAMPINGS
IN SMALL LOTS
The Stamping illustrated was produced by our patented process at a cost of
$58.00 for the first 100 pieces
8.30 for each subsequent 100
plus actual market price of material. Your stampings of any size or shape up to ¼" thick can be produced in proportion to this price.
DAYTON ROGERS
Manufacturing Company

2826 13th AVE. S • MINNEAPOLIS 7, MINNESOTA

Over-age Machines Cost You Money!

Over 42 per cent of metalworking production equipment was over 10 years of age in 1949 . . . 19 per cent was bought more than 20 years ago. These machines have had an average of a quarter century of use, including five years of wartime overwork and mistreatment.

How does *your* production machinery and equipment compare with your competitors', and with the Metalworking Industry's in general? The answers will be found in the *American Machinist* Mid-Century Inventory of Metalworking Production Equipment.

Here are all the facts on the age and number of 155 major types of production equipment operating in 15 metalworking divisions and 25 major production areas. Cost is $2.00 per copy.

Write Reader Service Department:

American Machinist
McGraw-Hill Building
New York 36, N. Y.

SCHAERER

HIGH DUTY LATHES for PROMPT DELIVERY

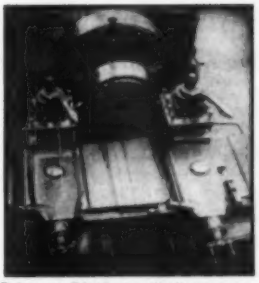
Built to the Highest American Standards of Accuracy, Productivity and Convenience

With the attachments available, these German-designed and built lathes represent the maximum in versatility . . . production lathes built to tool room standards, recognized universally for high precision and top performance.

Specifically, the SCHAERER HIGH DUTY LATHE offers:

- . . . all gears in headstock hardened and ground.
- . . . front and rear main spindle bearings lubricated by separate oiling system.
- . . . main shaft motor-driven through forward and reverse multidisc clutches.
- . . . multiple-screw cutting attachment provided on headstock.
- . . . quick-change gear and carriage equipped with one-shot oiling system.
- . . . carriage automatically released by friction clutch in case of overload.
- . . . cross slide equipped with ball catch stop for accurate adjustment of depth cutting.
- . . . adjustable carriage stop provided for longitudinal turning.

Full detailed specifications are contained in illustrated brochure available promptly on request.
Come and see these lathes in operation under power. Bring samples for test purposes if you wish.
Variety of tooling combinations available.



Twin cross slides for two simultaneous cuts.

Condensed Specifications

18" to 20" swing available.
20" to 22" swing over gap.
Distance between centers from 20" to 120".

Hydraulic Copying Attachment with twin cross slides for facing work and turning between centers.

M. B. I. EXPORT & IMPORT LTD.

475 GRAND CONCOURSE — MBI — BRONX 51, NEW YORK

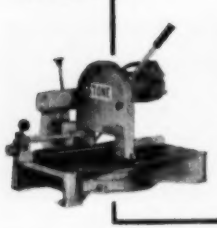
You Cut
FASTER
MORE
ACCURATELY
at LOWER COST

with STONE
High Speed
CUTTING MACHINES

Models Available for ALL SHOP NEEDS!

← MODEL M-75

A floor model, 2½' x 4' equipped with full 7½ h. p. geared-in-head motor engineered with positive drive, will cut all ferrous and non-ferrous solids up to 2½" — pipe and structurals up to 4". Can be furnished equipped for wet cutting.



← MODEL SS-20

Operates on guided rails for cutting larger structural steel, plate, sheet, with cuts up to 10 feet in length. Cuts wet or dry.

← MODEL M-14

32" x 34" Bench Model. This mighty little brute, with full 3½ h. p. geared-in-head motor engineered with positive drive, will cut all ferrous and non-ferrous solids up to 2"— pipe and structurals up to 2½". Two models — straight cut-off and swivel head for angle cutting to 45°. Legs available.

For complete information, write to

STONE MACHINERY CO., INC.
Fayette St. Manlius, N. Y.

your best buy in modern milling machines:

GREAVES NO. 2-H

Plain or Universal

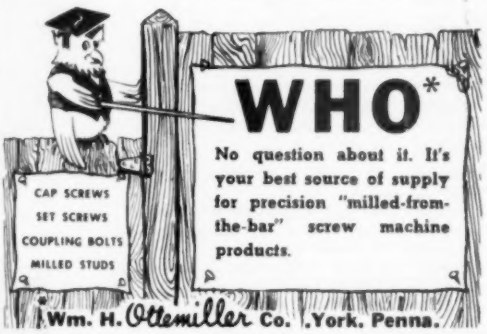
- **Offers every modern milling machine advantage:** 18 spindle speeds 25 to 1250 rpm, 18 feeds ½" to 30" per minute, rapid traverse, Timken bearings and many others.

You can't buy a better combination of simplicity, rugged construction, ease of operation, accuracy and production speed.

Send for bulletin and price list.

GREAVES

THE GREAVES MACHINE TOOL CO.
2100 Eastern Avenue, Cincinnati 2, Ohio


WHO*
No question about it. It's your best source of supply for precision "milled-from-the-bar" screw machine products.
CAP SCREWS
SET SCREWS
COUPLING BOLTS
MILLED STUDS
Wm. H. Ottemiller Co. York, Penna.

American Machinist

helps you sell

Do not miss this event!
SEPTEMBER 14th to 23rd 1952
2ND EUROPEAN MACHINE TOOL EXHIBITION HANOVER
SEPTEMBER 14th TO 23rd 1952

GENERAL INFORMATION BY: GENERALKOMMISSARIAT
DER 2. EUROPAEISCHEN WERKZEUGMASCHINEN-AUSSTELLUNG

HANNOVER-MESSEGELAENDE (GERMANY)
TEL.: 86501—CABLE ADDRESS: MODUL—TELEPRINTER: 023728

California Calling ENGINEERS

A better job, a better life, a better future can be yours in California—at Lockheed Aircraft Corporation.

On the job, you enjoy increased pay; fine, modern working conditions; association with top men in your profession—men who have helped build Lockheed's reputation for leadership.

Off the job, you live in a climate beyond compare—where outdoor living can be enjoyed the year around.

In addition, Lockheed's production rate and backlog of orders—for commercial as well as military aircraft—insures your future.

TO ENGINEERS IN NON-AERONAUTICAL FIELDS

The step up to Aircraft Engineering isn't as steep as you might expect. Aircraft experience isn't necessary. Lockheed takes your experience, your knowledge of engineering principles, your aptitude and adapts them to aircraft work in its Engineer Training Center.

You learn to work with closer tolerances. You become more weight-conscious. You may attend classes in the Training Center for three days—or six weeks. It depends on your background. But, always, you learn at full pay.

NOTE TO ENGINEERS WITH FAMILIES:

Housing conditions are excellent in the Los Angeles area. More than 40,000 rental units are available. Thousands of homes have been built since the war; huge tracts are under construction now. You will find the school system as good—from kindergarten to college.

Send today for free, illustrated brochure describing life and work at Lockheed in Southern California. Use handy coupon below.

Mr. M. V. Mattson, Empl. Mgr., Dept. AM-8

LOCKHEED

AIRCRAFT CORPORATION, Burbank, Calif.

Dear Sir: Please send me your brochure describing life and work at Lockheed.

My name _____

My address _____

My city and state _____

My occupation (type of engineer) _____

OPPORTUNITIES

Expanding C-119 and C-123 Aircraft Program at Willow Run offers fine opportunities and steady employment for qualified men

- Tool and Die Engineers
- Industrial Engineers
- Plant Engineers
- Time Study Engineers
- Aircraft & Engine Mechanics—Licensed
- Tool and Die Designers

KAISER-FRAZER CORPORATION

Willow Run (near Detroit), Michigan

20 YEARS SERVICE

To Top COMPANIES and EXECUTIVES

As the National Clearing House for QUALITY in men and positions—assures you the utmost in understanding and confidential handling of YOUR requirements for a MAN or a POSITION. Write for details:

B. T. BAGLEY
CADILLAC EMPLOYMENT AGENCY
Suite 614 — 220 S. State St.
Chicago 4, Ill. — WAbash 2-4800

SALES ENGINEER

Company	Manufacturer of labor saving machinery. Old, well financed, medium size, progressive.
Age limit	Near New York City.
Experience	Travel necessary.
Salary	33 - 45
Location	Methods department of machinery, steel or can manufacturer.
	Good, dependent upon past experience. Informal bonus arrangement.

Replies will be held in complete confidence. Company employees know of this opening.

BOX 32, DOREMUS AND COMPANY
120 Broadway, New York City

CAN MANUFACTURING MASTER MECHANIC

Must have practical experience on high speed automatic can making equipment and ability to supervise maintenance machine shop that services presses, tools, dies, and can making equipment. Give full details in first letter. Salary open. Location—Metropolitan New York.

P-4800, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

MACHINE TOOL-Designer. First class designer for machine tools, especially knee type milling machines and horizontal boring machines, wanted for machine tool company in Sweden. Reply with references, age, photo and salary desired, to "KMV 30652". AB Svenska Vastra Kyrkogata 12. Stockholm C, Sweden.

SELLING OPPORTUNITY OFFERED

WANTED MACHINE Tool Sales Engineer, Central Engineer, Central New York State, exclusive top lines. In reply, give age, experience, education, and business background to SW-4888, American Machinist.

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 42 years). Procedure of highest ethical standards is individualized to your personal requirments. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

POSITION WANTED

WOULD LIKE to contact Tool, Machine, or Job Shop in need of a shop foreman or supt. of long and varied experience. PW-4909, American Machinist.

BUSINESS OPPORTUNITY

Wanted: old established manufacturer of machine tools and machine tool accessories wants some patented design for manufacturer, either on a royalty or commission basis. Equipment should have some definite appeal to the machine tool trade, to be sold through manufacturers' representatives. BO-4744, American Machinist.

PROCESS ENGINEERS
TOOL DESIGNERS
OPERATION SHEET WRITERS
TOOL TROUBLE MEN

FAIRCHILD
ENGINE DIVISION
OF THE
FAIRCHILD ENGINE & AIRPLANE CORP.
New Highway, Farmingdale, Long Island, New York

WORN DIAMOND TOOLS

PROMPTLY RESET

24 HOUR SERVICE • $1.00

DI-TRU TOOL COMPANY
1479A 38th Street — Brooklyn 18, N. Y.
Phone ULster 3-3426

WANTED

BESLEY GRINDER
DOUBLE DISC 2226
WITH ROLL FEED ADJUSTMENT
Box M, 1783, 221 W. 41 N. Y. 36, N.Y.

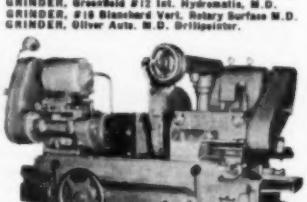
BUY FROM STOCK
Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

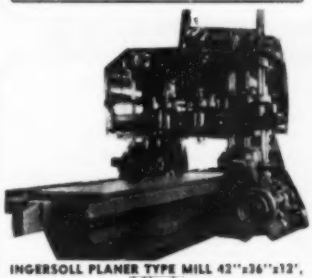
AUTOMATIC, #90 Brown & Sharpe, 3/16" cap.
AUTOMATIC, Cleveland Model #B-1½" Bgl. Spdl.
AUTOMATIC, National-Acme Sgle. Spdl. 4¼".
AUTOMATIC, Semi #2 B & S Wire Feed, 1" screw.
BALANCER, Andrews Bros. 14"x84", Rots-Checker.
BORING MILL, 2½" Lucas Horiz., M.D.
BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 90" Bullard M.D., V.T.L.
BORING MILL, 36"x44" Niles Vert., M.D.
BORING MILL, 48" Bullard M.D., 2 Heads.
BORING MILL, 80" Betts Vert. 2 heads.
BORING MILL, 10' Cincl-Vert., M.D., 2 heads.
BORING MILL, Lucas #31 Horiz. 5" Bar, M.D.
BORING MILL, Giddings & L. #32 Horiz. 3½" Bar.
BARRELS, Tumbling Lapomatic, Schotte & Koerting.
BROACH, #3 LaPointe Horiz. 50" Str. M.D.
COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMPRESSOR, C-P 50 HP., M.D., 10x10, 278 CFM.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMP., Ing.-Rand ER-1, 100 HP Sys. M.D.
CRANE, GET Rieker 2 ton 11'9" span.
CRANE, GET Shaw 10 tons, 58'8" span.
CRANE, Cantoo #9 Portable Gooseneck 3 ton cap.
CHIP WRINGER, Garrett #25I, M.D., 18" dia.
CHIP WRINGER, 20" Tolhurst M.D., Late.
RADIAL DRILL, 3'x9" Cincinnati-Bickford, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'x15' Cincinnati-Bickford, M.D.
RADIAL DRILL, 36" Walker Turner M.D., Late.
DRILL, Fondisk 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D., #4 M.T., M.D.
DRILL, #121 Baker Auto., S.S. Cam Operated.
DRILL, Deep Hole, Avey-Drmilie #2, M.D.
DRILL, Deep Hole, Pratt Whitney #2 Gun Barrel.
DRILL, Edlund #20, 8 spdls. #2 M.T., 16".
DRILL, 4 & 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRIL, 4 Sp. Barnes H.D., M.D. #4 M.T., P.F.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, Natco Multiple Spdle #12, #1 M.T., M.D.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4.
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 20" S.S., #4 M.T., 1¾" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40° below zero.
DEMAGNETIZER, SB-911 Magnaflux, late type.
FACING HEADS, 20" & 24" Mummert-Dixon.
FILER, #11-S Cushman Bly Auto Saw Filer.
FILER, #11-S Type P4, Floor Type, M.D. Thiel
FURNACE, Westinghouse Elec. 18 KW, 2100° F. cap.
FURNACE, Moebius Oven, Size #3040.
GRINDER, #2 Cinc. Centerless, M.D. Thru Feed.
GRINDER, #4 6 & L Univ. Tool & Cutter, M.D.
GRINDER, Diss. Besly #296, 18" Dble. End.
GRINDER, Heald Rotary #25, M.D. 10" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #14 Univ.12"x30".
GRINDER, Cylindrical, Cinc. Gr.10 Filmatic, Late.
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-S Internal Size-Matic.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, 6"x18" Norton "C" Hyd. Plain Cyl. Late.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, #18 Blanchard Vert. Rotary Surface M.D.
GRINDER, Oliver Auto. M.D. Drillpointer.



LANDIS 6 x 18 Hyd. Cyl. Grinder, Type C. Serial #29196.

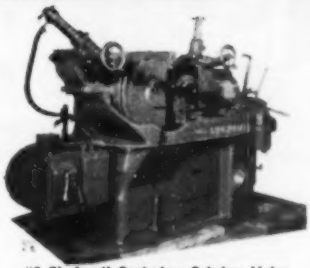
GRINDER #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4½".
GRINDER, Norton Gr18 Vert. Surface, Hyd. Late.
GRINDER, #00 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 27" Wheel Dia. Osterbein Disc, 25" cap.
PROFILE GRINDER, Studer Type PSM, M.D., late.
GEAR HOBBER, #3 Barber Colman, M.D.
GEAR HOBBER, B & S #34 Spur, 10" dia. M.D.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.
HAMMER, Rochester Hispeed, all sizes M.D.
HANNER, Bradley 2002 Rubber Cushioned Helve.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
INDUCTION HEATER, 18 KVA, Ecco Hi Frequency.
INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HOIST, 5 ton capacity Shepard Electric.
HONE, #194 Barnes Vertical, M.D. Hyd. Late.
KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 29" Norton Vert., M.D., late type.

DISC GRINDER
Osterbein 27" Wheel Diameter Disc Grinder. 40 HP. TEFC 3/60/440 spindle motor drive. 24" capacity.



INGERSOLL PLANER TYPE MILL 42"x36"x12', 4 Heads.

LATHE, Le-Swing 8"x100", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 8"x15" Geared Head Prod.
LATHE, 12"x18" Lipe Carbo. Late Type, M.D.
LATHE, Hendey 12"x5' G.C.G. Taper Attach. M.D.
LATHE, LeBlond 14"x8', G.C.G. M.D.
LATHE, Hendey 14"x8' G.C.G. Taper Attach. M.D.
LATHE, Lodge & Shipley 16"x8', G.C.G., Grd. Hd.
LATHE, American 16"x8' G.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' G.C.G., M.D.
LATHE, American 18"x10' G.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, G.C.G. M.D.
LATHE, Hendey 20"x10' G.C.G., Taper Att. M.D.
LATHE, Reed-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LeBlond 22"x10' G.C.G., M.D.
LATHE, Putnam 24/52"x12' G.C.G., M.D.
LATHE, LeBlond 24"x14' G.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', G.C.G., M.D.
LATHE, McCabe 28/48"x10' Double Spindle Lathe.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, Bridgeford 32"x16' G.C.G., Grd. Hd.
LATHE, Bullng Dble. End #VMTS, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head
LATHE, Turret #2 Bardons & Oliver Late Type, M.D.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret, #4 Warner & Swasey Univ. 1¼".
LATHE, Turret, #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #1 Cincl. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LIFT TRUCKS, Baker 1 & 2 ton, Platform & Fork
MILL, #4 Burke Motor Drives, Late, M.D.
MILL, 30 H. Sundstrand Horiz. Hyd. 2 Sp. M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, #46 Brown & Sharpe H.D., Horiz. M.D.
MILL, #16 Garvin Plain Horiz., M.D.
MILL, #9Y Brown & Sharpe Plain Horiz., M.D.
MILL, Cinc. Horiz. #3, #4, #5 High Power, M.D.
MILL, #8C Becker Vert. Die Sinker, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-S Cinc. Vert. Prod. Late, M.D.



#2 Cincinnati Centerless Grinder, Motor Drives, Thru Feed.

MULT-MILLER, U.S. Tool #MM-1-S, Auto. Prod.
MILL, #0 Vernon Hand Mill, M.D. Late.
MILL, PLANER, Ingersoll 42x50x12, 4 heads.
MILLING MACHINE, Kempsmith #3 Horiz. Univ.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILL, #4 Cincl. Vertical Hi Power, M.D.
MILLING MACHINE, LoBlond #4 Horiz. Univ.
THREAD MILL, 7½x11 Hanson-Whiting, Univ.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 KW.
NIBBLER, Grey Turret Type ¼"x24" cap. M.D.
OZALID Model "F" Whitepr int Machine, Late.
THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL 6x14 Pratt & Whitney No. 1105
THREAD MILLER, Lees-Bradner #40A Automatic.
THREAD MILLER, Pico-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.
PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #184 Open Back, M.D.
POWER PRESS, Bliss #34, S.S. Dble. Crank Grd. 45 tons, 6" stroke, 30"x24" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #108-S Straight Side Dble. Crank 45 tons, M.D.
PRESS, 135 ton Clearing Single Crank 8" Str., Late.
PRESS, 70H Drake Hydraulic Arbor, New.
PRESS, #79½, Bliss S.S. 9½ Str., M.D.
PRESS, Robinson #6 O.B.I. 80 tons, M.D.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #15, #19, #20, #21, OBI, A.C., M.D.
PRESS, Toledo 50½ S.S. 440 ton cap. 8" str.
PRESS, Waterbury-Farrell High Speed 60 tons #3W.
PRESS, DBC Bliss Double Action, 3 crank.
WHEEL PRESS, Chamberlayne 400 tons cap. Hyd.
PRESS, Lucas 15 tons Power Arbor M.D.
PRESS, #36 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Farrousels M.D. Roll feed.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, B-41-P Wiedemann Turret, 14 stat. 24" thr.
PUNCH, Hasker Turret, 9 stations, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End. 24" Thr. 1" thru 1".
PUNCH, H & J #5 Sgle end. 48" Thr. 2" thru 1½".
RIVET BETTER, ½" cap. Pneu. Tubular Rivet.
ROLLS, Bertsch Pyramid 18"x¾" cap., M.D., Late.
ROLLS #1 Buffalo Forge Wrapping, M.D.
ROUTER, #"W3600, Geared, Electric H.D.
COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 45° dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #48 Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #8 Marvel Band 18"x18" cap., M.D.
SAW, #30C Campbell Abrasive Cut-off, M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap, M.D.
SAW, Band, Tannewitz & GM-36" High Speed, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 24 "Rockford Univ. M.D., Tilting Table.
SHAPER, 6 & K 24", high duty, back geared, M.D.
SHAPER, 32" Cincl. S.G.C., Motor driven, H.D.
SHAPER, Morton 36" Draw-Cut, 4-Speed, M.D.
SHEAR, Quickwork 8-1 Rotary 60" Throat, 18 ga.
SHEAR, #8E Niagara M.D. 6"x3/16" cap. M.D.
SLOTTER, 12" New Haven Vertical, M.D.
SPRU CUTTER, Milwaukee 50 tons, 2½" cap. M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 CAM Hasking, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
WELDER, 200 & 400 amps. Gen. Elec., Portable, Arc.
WELDER, 200 KVA Federal, Projection.
WELDER, 75 KVA Federal, M.D., Spot.
WIRE STITCHER, Morrison and Acme, M.D.

OTHER 2000 MACHINE TOOLS AVAILABLE "IN STOCK"

WHY SEARCH?

WE CAN SUPPLY YOU WITH ALL YOUR MACHINE TOOL NEEDS

OVER 30 YEARS EXPERIENCE

GEAR MACHINERY

12" No. 12 Barber Colman hobbers (two)
12" No. 12H Gould & Eberhardt universal hobbers (two)
16" Cincinnati hobber
24" No. 3 Adams Farwell hobber
60" No. 5 Brown & Sharpe cutter
72" Schuchardt & Sihutte universal hobber
72" Westinghouse universal hobber
Nos. 1 & 5A Lees Bradner hobbers
No. 130 Cleveland "Rigidhobber"
4" Gleason spiral bevel generator

GRINDERS

6"x30" Cincinnati ER, in feed
10"x18" Norton semi-automatic
23", No. 228 Hanchett opposed disc
30", No. 84A Gardner opposed disc
Nos. 5, 16-28 & 24-36 Bryant internal
No. 72 Heald Gagematic & Sizematic
12", No. 22 Heald rotary surface
6"x18" Doall hydraulic surface
No. 2 Cincinnati centerless
No. 2 Brown & Sharpe universal

COMPLETE MACHINERY SERVICE

LATHES

10"x30" centers Monarch QCG, T.A.
12"x24" centers Hendey yoke head, QCG
14"x36" centers Lodge & Shipley G.H. QCG
16"x36' centers Sundstrand, QCG
24"x12', 13', & 14' Americans, G.H., QCG (3)
30"x16' LeBlond QCG
9"x14" Carbo-lathe
12" Sundstrand stub
14"x33" Fay automatic
Two Gisholt Simplimatics
Sundstrand brake drum

MILLERS

No. 2 Cincinnati plain, motorized
No. 3 LeBlond, motorized, 18 speeds, 16 Q.C. feeds
No. 3B Kearney & Trecker, 18 QC speeds, 12 Q.C. feeds
24" Cincinnati automatic duplex
30", 42", & 84" rotary continuous (Newton & Ingersoll)
48"x36"x12' Ingersoll planer type, adjustable rail
4" No. MB0 Taylor & Fenn spline
8"x16" Hanson Whitney thread
4½"x12" & 6"x14" P. & W. thread
No. CT36 Lees Bradner thread

MONEY BACK GUARANTEE

PRESSES

50 ton Warco OBI, air clutch
No. 56½ Toledo straight side
No. 77½ Bliss S.S. trimming
No. 245½ Hamilton straight side
36", 88 ton Cleveland dbl. cr., hydr. clutch
Nos. 92½D, 93½C & 94½E Toledo dbl. cr.
600 ton No. 570 Toledo forging, air clutch
650 ton Hamilton forging
400 ton Ferracute EG54 coining
650 ton, No. 8411 Hamilton double action toggle, hydr. clutch

SHAPERS & PLANERS

16" Smith & Mills shaper
24" Stockbridge shaper
24" Niles traveling head shaper
26" Smith & Mills shaper
27" Morton draw cut shaper
32" Ohio Dreadnaught shaper
28"x28"x8' Gray planer
36"x36"x8' Cleveland O.S. planer
36"x36"x8' American planer
36"x36"x12' Niles B.P. planer
48"x48"x12' Gray planer

WRITE FOR LATEST CATALOG

MILES MACHINERY COMPANY

2025 E. GENESEE AVE. • SAGINAW, MICHIGAN

Phone Saginaw 2-3105

FINE LATE TYPE GUARANTEED TOOLS

60"x20' NILES BEMENT POND Geared Head Engine Lathe, rapid traverse

56"x18' C.M.C. Heavy Duty Lathe. 24 Speed Geared Head, power rapid traverse, 30 HP AC motor

28"x12' MONARCH Heavy Duty engine Lathe, taper attach., chucks, AC-MD

24"x72" centers Boye & Emmes heavy duty G.H. Engine Lathe, chuck, A.C., m.d.

No. 3L GISHOLT Turret Lathe, 5-1/16" hole in spindle, bar feed, chucks, tooling, new 1943

No. 2B FOSTER Geared Head Turret Lathe, rapid traverse, AC motors

No. 60 NEW BRITAIN AUTOMATIC, 1" capacity, 6 spindle, rebuilt, new 1942

54" Bullard Spiral Drive vertical Turret Lathe. Serial 23000. New 1943. Like New.

42" BULLARD Vertical Turret Lathe, New Era type, AC—MD

42" BULLARD Spiral Drive Vertical Turret Lathe, Serial 24000, New 1945

36" BULLARD Spiral Drive Vertical Turret Lathe, AC—MD, rebuilt

No. 1 DOUGLAS Plain Horizontal Mill, table 8"x32", power feeds, motor in base, Timken spindle, No. 40 taper, new 1942

#2 Van Norman Plain Mill. New 1942.

5'-13" column CARLTON Radial Drill, AC motor on arm, 15-1500 RPM, box table

4' AMERICAN High Speed Sensitive Radial Drill, 9" column, AC motor on arm

No. 6 TOLEDO O.B.I. Press, 50 Tons

#13 Brown & Sharpe Universal Tool and Cutter Grinder. New 1943.

25A HEALD Rotary Surface Grinder, 24" diameter, magnetic chuck

10"x24" Norton Surface Grinder. New 1943.

36" OHIO Dreadnaught Shaper, AC—MD

36"x36"x10' G.A. GRAY Maxi-Service Planer, reversing motor drive, box table, rapid traverse

1½" LANDIS Bolt Threader, leadscrews, AC—MD

75 Ton HENRY & WRIGHT Double Crank Dieing Machine, roll feed & scrap cutter

O'CONNELL MACHINERY CO.

Tel: BAlley 5800

1695 GENESEE ST. BUFFALO 11, N.Y.

NEW LATHES AT BARGAIN PRICES

New 18" x 80" Centers MEUSER LATHE and 24" x 120" Centers MEUSER LATHE. Complete with Taper Attachments, Chucks and all equipment. *GAP BED TYPE.* Available from stock all sizes up to 32" Swing. Will trade for other equipment.

WINSTON MACHINERY CO., INC.
326 W. OHIO ST. INDIANAPOLIS 2, IND.
PLaza 2408

SOME LATE MACHINES STILL AVAILABLE

BORING MILLS

Bullard 24" V.T.L., Spiral Drive
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 32, 3" cap.
King 42", 72" Vert. 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vert.
New 3" Hor. Bor. Mills

DRILLS AND RADIALS

American 6'x15" Univ.
Bausch Multi-spindle
Buffalo #2 Motor Spindle
Canedy-Otto 21" Sliding head New
Cincinnati Bickford 6'x15" col.
Natco #12 20 spindle drill, Bausch
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" cap.
Leland Gifford 2 LMS 3 MS

ENGRAVERS

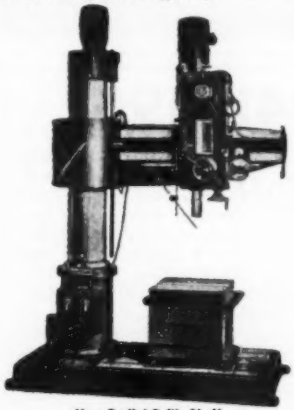
Deckel type 3 Dim., New
Gorton 3S Die Sinker
Gorton #1A, ME, Deckel G1L
Taylor-Hobson 3 dim.

GEAR EQUIPMENT

Barber-Colman #2, #12 (3), Flather 72" Cutter
Fellows High Speed Shapers 712, 725, 71
Fellows #20M Redliner
Flather 72" Cutter
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter
Michigan Gear Finisher 24" cap., 862-24-A
National Broach Red Ring Lapper
Schuchardt & Shutte #1 Hobber

GRINDERS, MISCELLANEOUS

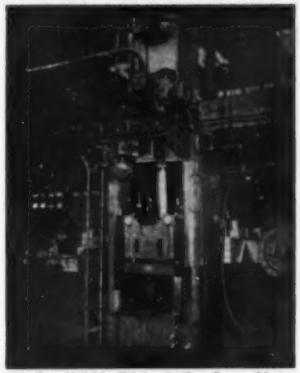
Bryant #3, Internal, chucking, 16A16
Cincinnati 6x18" Cyl. Hyd.
Heald #73 Internal Centerless, Sizematic
Heald #81 Internal Geomatic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ.
Majestic Internal, Grendy
Norton Type C 6"x18" Semi-Automatic cyl.
Norton 6"x30", 10"x18" Type C cyl.



New Radial Drills 3', 4'

NEW IN STOCK

Air Hydraulic Presses — Arbor Presses #6C Famco — Band Saws Kalamazoo — Famco 6x12"—Drill Presses all sizes—Hydraulic Press Northern 20 Ton — Injection Molders, 1 ounce — Power Presses, OBI, 1, 4, 4½, 5, 7½, 10, 15, 20, 30, 55, 85 ton—Shaper 7" Amco, 8" Shaperite — Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power 3'x18 gauge to 10' x 10 ga.—Welders, Arc, Seam, Spot all sizes Motors, Grinders, Buffers.



150 Ton H.P.M. Triple Action Press 50 ton cushion, 50 ton blankholder, bed 36" x 36".

Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Sellers 6T Tool, K.O. Lee tool
Van Norman #666 Crankshaft
Wicaco Internal

GRINDERS, SURFACE

New 8x24" Hyd. Feed, 10x18"
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Heald 22—12" chuck, Arter 12"
Norton 6x18" Hyd., 10x36" Hydr.
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vert.
Reid 11x36 Motor in Base
Taft Pierce #1 Precision

LATHES

American 14"x30
Bridgeford 36"x20', 32"x16'
Handey 12"x42" and 12x30", 1941, 16x66"
Handey 14" Yoke Head Lathes
LeBlond Regal 10"x3' bed, 19x42"
Lipe-Corbo 12"x18" (2)
Late, P. & W. 16"x60
Lodge & Shipley #3A, #3 Duomatics
Sebastian 12"x4' G.H., Sheldon 12"
Wickes 32"x35' Geared Head
Reid Small Piece #9WSL
Sundstrand 8x15", 15" Stub
Rivett Model 918 Precision
New 16, 18, 20", 28" Immediate Del.

MILLS, PLAIN, UNIV. PROD.

Brand New Universal Mills No. 1, No. 2
Archdale Plain, 14", Prod.
Brown & Sharpe #3B Plain, Late, 3A, 21, #2L
Cinn. No. 3, 4 Plain Spd.
Kent Owens 1V, 1-8, 1-14, 1M
Kempsmith #1 Pl.,Vert. & Div. Hd.
Milwaukee 2K, 2H Univ., 2H Plain.
Milwaukee #2B, Plain & Univ.
Simmons Micro-Mill #1A
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmill with copying Attach, 33
Van Norman #2L Univ.

MILLS, VERTICAL

Brand New Vertical Mills
Cincinnati #3, #4 hi-power
Cincinnati 08 Vertical
Morey #12M Profiler, 2 sp.
Pratt & Whitney Profiler 12B, 3 sp.
Reed Prentice 3V

PRESSES

Bliss 645, 650 Hi-Production Presses
Bliss 18, 21, OBI, 58, 62, 162, OB.
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton, 55, Bliss 74½
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
Bliss 5-48 Dbl. 32x48" bed, Cushion
Toledo 92½c Dbl. Crank 43x23" bed.
New 85, 60, 55, 30, 20, 15, 10, 8 Ton O.B.I.
Niagara Herring, 15 Ton
Niagara A1½, O.B.I.
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, LJ #3

TURRET LATHES

Acme 6W Fox 2-9/16" Cap. #2 Cross Slid. Turret
Bardons & Oliver #2, 3, 5, 7
Brown & Sharpe, #2 Hand, #10, 11
Denver 6 2" Shell Turret (2)
Foster #2B 2½" Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur. #5 Bar Feed, Chuck
Gisholt Simplimatic
Jones & Lamson #5, Bar Feed
Morey #2G Late
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1A, Timken Head
Warner & Swasey #1, 2, 3, #4 Preselector

MISCELLANEOUS

Automatic; New Britain 61 6 Sp. 1½" Late
Automatic, Cleveland Model B 1-1/16", A
Automatic B & S #00G 0G, 2G
Automatic 4 Sp. 1½ Conomatic
Band Saw: DoAll Zephyr 36", 16" Metalmaster
Bolt & Pipe Threader: Landis, Oster-Williams #915 Pipe & Nipple Threader
Broach: 3L LaPointe Hydro. Horiz. New Klink. 6 Ton
Hacksaw: Peerless 6"x6"
Honer: Micramatic H-4
Keyseater Davis, Baker
Oil Groover: WICACO
Shapers: 24" Rockford, 24", 28" Gould & Eberhardt, Clan. 20, 24"
Shears Power: George Ohl 10' 3/16", 18' x 16 gauge, 11' 16 gauge
Welder: 50 KVA Elster Air Operated, New Seam.
Welder: Taylor-Winfield 50 KVA Hi-Wave

New Lathes 16" to 28", Mills, Boring Mills, Broaches, Shears & Presses

HYDRAULIC EQUIPMENT

SELF CONTAINED PRESSES

150 Ton Triple Action HPM Press
125 Ton Southwark Press, Bed 96"x30", 30" stroke, 2 to 4 ft. opening
8 and 9 oz. Injection Motors

MISCELLANEOUS PRESSES

300 Ton Watson Stillman 20"x20" Platen 8" St. 19" opening

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

This is but a partial listing. Write for free Catalog. Inquiries Invited. HUNDREDS OF OTHERS

AARON MACHINERY CO., Inc., 45 Crosby Street, New York 12, N. Y

"CABLE—AARMACH N. Y." **Telephone WOrth 4-8233**

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

ENGINE LATHES

9x24" Hendey Tool & Gaugemaker's, m.d.
12x24" LeBlond Regal Geared Head, m.d.
12x6' Lodge & Shipley Geared Head, m.d., taper
13"x30" centers Pratt & Whitney Model B, m.d., taper
14"x25" gap x 8' between centers LeBlond, m.d.
14"x8' bed Hendey Geared Head, m.d., taper
14"x8' Lodge & Shipley Geared Head, m.d.
14"x8' Pratt & Whitney, cone
14"x8' LeBlond, cone
14"x8' Sidney Geared Head, m.d.
14"x8' Springfield Geared Head, m.d., taper
14"x8' Prentice, m.d., taper
14"x8' Sidney Geared Head, m.d.
16"x10' Pratt & Whitney Geared Head, m.d.
16"x6' Cisco Geared Head, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' Lodge & Shipley, cone
16"x6' bed Monarch Geared Head, m.d.
16"x84" Pratt & Whitney Type B, m.d.
16"x8' Head Prentice Heavy Duty, cone, taper
17"x6' LeBlond Geared Head, m.d.
18"x5' LeBlond Geared Head, m.d.
18"x6' bed Lodge & Shipley, cone, motorized
18"x6'6" Greaves-Klusman Geared Head, m.d. in leg
18"x7' Hendey Geared Head, m.d., taper
18"x8' Hendey Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Champion, cone
18"x8' Whitcomb-Blaisdell Geared Head
18"x10' Boye & Emmes, m.d.
18"x10' Springfield Geared Head, m.d., taper
19"x6' centers LeBlond Geared Head, m.d., taper, Late
20"x36" centers Schumacher & Boye, cone
20"x8' bed American Geared Head, m.d., taper
20"x8' Cisco, cone
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x10' Boye & Emmes, cone
20"x10' Lodge & Shipley Geared Head, m.d.
20"x10' Sidney Geared Head, m.d.
21"x8' Heavy Duty LeBlond Geared Head, m.d.
21"x10' LeBlond Geared Head, m.d.
21" Walcott, Cullman M.D.
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
23"x12' LeBlond, cone, motorized
23"x14' bed LeBlond Geared Head, m.d., taper
24"x10' Lodge & Shipley Geared Head, m.d., taper
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d.
24"x12' bed Boye & Emmes, belt drive
24"x12' Bridgeford Geared Head, m.d., taper
24"x13' bed Lehmann Geared Head, m.d., taper
24"x16' bed American, cone, motorized
24"x16' Cisco, cone, motorized
24"x24' bed Lodge & Shipley Geared Head, m.d., taper
24"x30' bed American Geared Head, m.d., taper, Late
25"—36"x8' centers LeBlond Gap Lathe, m.d.
28"x8' Bridgeford Geared Head, m.d.
30"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'6" bed Niles-Bement-Pond, m.d.
30"x16' bed Lodge & Shipley Geared Head, m.d., taper
30"x16' bed LeBlond Geared Head, m.d.
30"x38' American Triple Geared Internal Face Plate Drive, m.d., taper
48" American (raised to swing 54") x12' bed, m.d.
42" Putnam (raised to swing 50½") x20' bed Geared Head, m.d., 11'8" center
44" swing x15' bed American, m.d.

HAND MILLING MACHINES

No. 3 Garvin, m.d.

MANUFACTURING TYPE MILLING MACHINES

Rowbottom Cam Milling Machine
Model 1495 Milwaukee Simplex Production Milling Machine, m.d.
3A Sundstrand Copy Rigidmill, m.d.
Type P Ohio Mfg., m.d.
4" Pratt & Whitney Spline, m.d.
No. 33 Kempsmith, s.p.d.
18", 24" Cincinnati Plain Automatic, m.d.
24" Cincinnati Duplex Automatic, m.d.
No. 21 Brown & Sharpe Automatic, s.p.d.
48"x48"x20' Ingersoll Fixed Rail Milling Machine, for tank work
Carter & Hakes, m.d.
48"x16' Newton Slab Miller, m.d.
54"x30"x17' Ingersoll Slab Miller, m.d.
Taylor & Fenn 2 spindle Spline Miller, m.d.

PLAIN MILLING MACHINES

No. 1B Milwaukee, m.d.
No. 1M Cincinnati, m.d.
No. 1½ Cincinnati, cone
No. 3 Van Norman Duplex, s.p.d.
No. 3B Milwaukee, m.d.
No. 2 Rockford, m.d.
No. 2G LeBlond, belted m.d.
No. 4 Ohio, cone

THREAD MILLING MACHINES

14"x16" UE Automatic Hob, m.d.
Hall Planetary, m.d.
6x14", 6x20", 8x48", 6x80" Pratt & Whitney
10x24" Hanson Whitney, m.d., latest

WRITE FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

MACHINE TOOLS—1941—1951

5—#00G Brown & Sharpe Automatic Screw Machines, standard equipment, silent stock tubes, vertical slides, serial numbers 17041, 17046, 17042, 17074, and 16771—late.

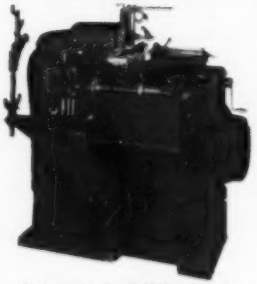
5—#0G Brown & Sharpe Automatic Screw Machines, standard equipment, silent stock tubes, vertical slides, serial numbers 11837, 11855, 11818, 11709, and 11836—late.

4—#2G Brown & Sharpe Automatic Screw Machines, standard equipment, silent stock tubes, vertical slides, serial numbers 8945, 10300, 10299, and 10497—late.

5—#00G Brown & Sharpe motor driven slotting attachments.

2—#0G Brown & Sharpe motor driven slotting attachments.

2—#2G Brown & Sharpe motor driven slotting attachments.



Style 1000—Sheffield Visual gauge.

A variety of adjustable guides, box tools, burnishing tools, die heads, floating holders, fixed guides, knurl holders, floating reamers and tap holders, recessing swing tool holders.

2—#1½ Grand Rapids Cutter and tool Grinders—late.

1—#10 Grand Rapids Cutter and Tool Grinder—1951.

1—Cincinnati #2 Centerless Grinder, with three extra regulating wheels and adaptors, three extra grinding wheels and adaptors, infeed and through feed rests with hand ejector—late.

2—Walker Turner 15" Floor Drills—late.

Grob Brothers #NS18—24"x24" Band Saw with welding attachment.

Clausing 12"x5' Engine Lathe GCG, with extra bed turret and hand lever cross slide—late.

South Bend Model A 9"x36" Lathe on bench, with chucks, milling attach, draw bar and collets—late.

Barrett #402 Oil Extractor—late.

2 HP Ingersoll-Rand Air Compressor.

1—1 Ton and 1—1½ Ton Electric Budgit Hoists.

KENT MACHINERY LIQUIDATORS

942 W. LAKE STREET — CHICAGO 7, ILLINOIS

Telephone TAylor 9-8200

OUTSTANDING MACHINE TOOLS

AUTOMATIC SCREW MACHINES
GYROMATIC Model 40 15/8" 6 spindle. Late
CLEVELAND 3¼ Model A; Late Type.

BORING MILLS—Horizontal
FRANKLIN 4½" Bar; table type; M.D.
LANDIS #40, 4" Bar; floor type; M.D.
LANDIS #35 floor type; 3½" bar; M.D.

BORING MILLS—Vertical
NILES 8" bar floor type, motor drive.
BETTS 126" 2 heads P.R.T.; M.D.
BULLARD 8", 16" 6-spindle "A" Mult-au-matic
COLBURN 72", 2 heads PRT. M.D.
NILES 100", 2 swivel heads; motor drive.

BRAKES & SHEARS
NILES 53", 2 swivel heads, motor drive.
BESCO 14 gauge 60" Press Brake; NEW.
BESCO 14 gauge 72" Press Brake; NEW.
BESCO 36"", 20 gauge Power Sq. Shear; NEW.
BESCO 48", ½" gauge Power Sq. Shear; NEW.
BESCO 48", 16 gauge Power Sq. Shear; NEW.
BESCO 48", 14 gauge Power Sq. Shear; NEW.
BESCO 72", 14 gauge Power Sq. Shear; NEW.
BESCO 96"x¼" Power Sq. Shear; NEW.
BESCO 96"x¼" Power Sq. Shear; NEW.
CHAMBERSBURG 500 HP, Billet Breaker; late type.
JAMES RENNIE No. 8, Univ. Ironworker; late type.
NIAGARA No. 116 Squaring Shears; late type.
QUICKWORK No. 5 ½" rotary, M.D.
QUICKWORK No. 8, 1" capacity; motor drive.
WORMSER T-15; T-25; Univ. Ironworker; NEW.

BROACHES
CINCINNATI 1-30 Duplex Vert. Hydr.
COLONIAL V.G. 1-10-48; Vert. Hydr. late.
OILGEAR 3XA Horizontal Int.; Late.

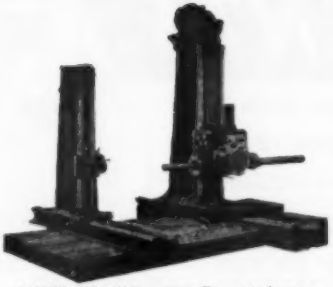
DRILLS—Radial
CINCINNATI BICKFORD 6'15" Univ.; M.D.

DRILLS—Miscellaneous
AVEY No. 3, Ball bearing, Motor drive.
BAKER No. 217; Late.
BARNES No. 420 Deep Hole; late.
BARNES H-3 Hydram; hydr.; inverted; late.
BARNES H-2 Hydram; hydr.; M.D.
BARNES 20" 4-spindle Camel Back, Late.
BARNES 24" all geared; Camel Back; M.D.
BODINE #42-20 multi-univ., dial feed; M.D.
CINCINNATI 21", late.
FOOTE-BURT, 6-spindle, late type.
LeBLOND No. 2, deep hole, late type.
LEMAIRE, 5spindle, late type.
MOLINE 6-spindle Hole-Hog 3¼"; M.D.
NATCO No. 14 Mult.; Rect. Hd.; PRT; M.D.

GEAR CUTTING EQUIPMENT
BILGRAM 6" & 16" Bevel Gear Cutter, M.D.
BROWN & SHARPE 6"-12" Auto. Cutter; M.D.
CROSS #1, #40, #45 Tooth Rounders; M.D.
DETROIT type GG-35 Gear Grinder; late type.
FELLOWS No. 4 Enveloping Gear Gen., M.D.
FELLOWS Nos. 61A, 6Z2, 75, 7, 7A, 72, 77 High Speed Gear Shapers; late.
FELLOWS 13-LS Lapper; late.
GLEASON #20 Tester Late Type.
GLEASON 25" straight dbl. gear gen.; M.D.
GLEASON #13 bevel cutter-grdr. M.D. late type.
GLEASON 18" bev. gear Tester & Lapper; M.D.
GLEASON #6 Revacycle. Late type.
GLEASON No. 12 Tool Sharpener; late.
GLEASON 12" Straight Bevel Gen.; late.
GLEASON #4 & #6 Tester, Late Type.
GLEASON 10", 11" & 18" Bevel Gear gen.
GLEASON 24", 37", 77", 96" Bev. Gear Planer
GLEASON No. 14 Hypoid Grinder; late.
MICHIGAN Gear Finisher, Model 862-24-A, 24" cap. Late Type.
PRATT & WHITNEY 10" Gear Grinder; late.

GEAR HOBBERS
BARBER COLMAN 12# Motor Drive.
BARBER COLMAN Type A; Late.
GOULD & EBERHARDT 8" H Vertical; Late.
GOULD & EBERHARDT #18H, Motor Drive.
GOULD & EBERHARDT #36 H; Late.
GOULD & EBERHARDT #36BM 3 spindle Auto. Rougher; M.D.
KOEFFER WM-11 Auto.; bench type; Late.
PFAUTER RS1; Max. dia. 30" late.

GRINDERS—Plain Cyl. & Univ.
CINCINNATI 14x72 Model EM Plain, Late.



LANDIS #40, 4" bar, Floor Type, Horizontal Boring, Milling and Drilling Machine.

LANDIS 16x36" Type C Plain, Hydr. Late type.
LANDIS 10x36" Type C Plain, Hydr. Late type.
LANDIS 10x18" Type C; late type.
LANDIS 4"x12" Type H, Plain; Late.
LANDIS 30"x240" Plain cyl., M.D.
NORTON 16x72; type C; plain; M.D.
NORTON 10x120; plain; M.D.
NORTON 14x50" plain; late.

GRINDERS—Surface
ARTER 8" Rotary, M.D.
BILLITTER & KLUNZ 48"x196" Way Grinder.
BLANCHARD #16 Hi Power Vertical; Late.
HEALD #22 Rotary, 12" chuck; m.d. Late.
PRATT & WHITNEY 14x36" Model B, Late.
THOMPSON 2V Special; late type.

GRINDERS—Miscellaneous
BRYANT No. 3 Internal; hydraulic; late.
BRYANT No. 5 Internal; hydraulic; late.
BRYANT No. 16-C-16 Internal; hydraulic; late.
BRYANT No. 16-CP-16 Internal; hydraulic; late.
BRYANT No. 24 Internal; hydraulic; late.
EXCELLO #48 Carbide Late.
HEALD 75A, special internal; late type.
HEALD No. 72A-5 "Gagematic" Int.; Late.
HEALD No. 72-A-3 "Gagematic" Int.; Late.
HEALD 72-A-3, 72-A-5 Plain; motor drive.
HEALD No. 78 Internal Centerless; M.D.
LEMPCO 22x72" Mod. KG Crankshaft; Late.
VAN NORMAN 666 Crankshaft Regrind.
VAN NORMAN 639 Osc. type Radius; Late.

HEADS AND UPSETTERS
ACME 2" Model XN, late type.
AJAX 3½" Upsetter, motor drive.
MANVILLE #3 DSOD, Motor Drive.
MANVILLE #2 DSOD, Motor Drive.
MANVILLE #1A DSSD, Motor Drive.
WATERBURY FARREL #11, DSSD, M.D.

LATHES—Engine & Mfg.
AMERICAN 36x32" centers geared heavy.
DENHAM 16x48" centers, Gap; late type.
DENHAM 12x54" centers, Gap; late type.
DENHAM 16x72" centers, Gap; late type.
GRAHAM NORMANTON 12"x48" centers; late.
HENDEY 12"x54" centers, belted motor drive.
JONES & LAMSON "FAY" 20x25" Auto. Late.
LEHMANN 16"x30" Hydratrol; late type.
LEHMANN 25x96" center; Timken; grd. M.D.
LeBLOND 16x36" center; Auto.; Timken; late.
LeBlond Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 14"x30" Centers, late type.
LODGE & SHIPLEY 16"x30" Centers, late type.
LODGE & SHIPLEY 24"x96" centers; Late.
LODGE & SHIPLEY No. 8—24" and 96" centers DUOMATIC Timken; Late.
LoSWING 4x60", 8x24", 8x108"; late.
MONARCH 14"x42" type Z, Magnamatic; late.
NILES 30"x46', 30"x50' Boring; "Time-Saver"; Timken; Late.
PORTER CABLE 9x14" High Speed; Late.
PORTER CABLE 12x18" Carbo; Late.
PORTER-McLEOD 16"x6'; NEW.
PORTER-McLEOD 16"x8'; NEW.
PRATT & WHITNEY 16"x30", Timken; late.
REED-PRENTICE 14"x54", Timken; late type.
SPRINGFIELD 16"x30" Centers, Timken; late.
SPRINGFIELD 14'x43", geared; M.D.
SUNDSTRAND 10x60" Auto. Late Type.
SWIFT 16"x72" Centers; M.D. Late.
SWIFT 20"x120" Centers; late.

LATHES—Turret
MOREY No. 2 ram type TIMKEN.
GISHOLT 1L, Saddle type, M.D.
MAGDENBERG Model MWF-BG-250 Univ. table type; P.R.T., 12" hole through spindle, cross sliding turret; M.D.; Late.
WARNER & SWASEY 4-A, Timken Bearing, 7½" Bore, motor drive.

MILLING MACHINES—Pl. & Univ.
BROWN & SHARPE #2B Timken M.D.
CINCINNATI #2 Plain, hi power Timken; M.D.
KEMPSMITH #2 Timken; Univ. M.D.
CINCINNATI 4-48,4 spindle, Tracer; Late.
ROCKFORD Rigid-Mill #3 M.D.
STARR No. 2, table 12"x55"; late.
RICHMOND #2, light, late type.

MILLING MACHINES—Mfg.
GOULD & EBERHARDT 25 Cont. type; M.D.
INGERSOLL 32x24x16' Planer Type; 2 hds.
INGERSOLL 30x24x12' Adj. Rail Slab; M.D.
SUNDSTRAND Mod. 3A Duplex 42" feed, M.D.
TAYLOR & FENN M-80 Duplex Spline; Late.

MILLING MACHINES—Thread
HALL Style D Planetary, Late Type.
LEES BRADNER HT 12"x54", M.D.; Late.
LEES BRADNER HT 12"x36" M.D.; Late.
MOREY 12x30" centers, 12x120" centers, late.
PRATT & WHITNEY 4½x12 Mod. C; late.

PLANERS
BETTS CONSOLIDATED 108"x84"x44', 4 heads; PRT; Box Table; M.D.
GRAY 24x24x6'; motor drive.
GRAY 36"x36"x10', 4 heads, PRT; Late.
LIBERTY 144"x76"x48" adj. variable, openside, box table; 4 heads, PRT; M.D.
NILES 108"x84"x42', 4 heads; Rapid Traverse; Box Table DC; M.D.
NILES-BEMENT-POND 72"x72"x30', 4 heads; Rapid Traverse; M.D.
NILES-BEMENT-POND 60"x60"x12', Rapid Traverse, 2 swivel heads, box table, M.D.

SAWS
CAMPBELL #401 Abrasive cut-off, Late.
ESPEN LUCAS No. 670 30' cap, Hydr.; Late.
GROB OS-20 metal band saw & filer; Late.
HELLER Model 8S-1, 6¼ Cap Cold Saw.

SHAPERS—Slotters
DILL 18" Slotter; motor drive.
PRATT & WHITNEY 5" Vertical; M.D.
PRATT & WHITNEY M 1251 10" Vert., M.D.
LYND FARQUHAR 26" Openside; M.D.
NEWTON 15" Slotter; M.D.
ROCKFORD 20" Vertical, Hydr.; Late Type.
ROCKFORD 24" Hydraulic; Late Type.

PRESSES
BESCO EB 2 Power Punching; NEW.
BESCO EB 3 back flywheel; NEW.
BESCO B-4; back flywheel; NEW.
BESCO No. 18, 18-ton OBI; NEW.
BESCO Mod. 21 Incl. 40 ton, 3" stroke; NEW.
BIRDSBORO 325 ton Vert. Hydr.; Late.
BLISS #6 SS DC 135 ton; 34"x96" bed; 2½" stroke; 60 SPM.
BLISS No. 410A Toggle Drawing; tie rod; steel gearing.
BLISS No. 3½A geared toggle; dble. acting.
GLEASON 15" Quenching; hydr.; M.D.
HANNIFIN 6-ton, 16-ton; hydr.; Late.
HANNIFIN 16-ton Hydraulic; late type.
NATIONAL #5 H.S. Maxi-Press (Forging).
SENTINEL 25-ton OBI; NEW.
SHORE 600 ton Hydr. Flanging & Forging.
TOLEDO #93 Straight Side DC 113 ton; 33"x 104" bed; 2" stroke; 70 SPM.
WATERBURY Farrel 125 Ton; St. Side.

MISCELLANEOUS
BAKER #5 Keyseater; motor drive.
BARNES No. 172, 214 Honing; hydr.; Late.
BAUSCH #21 Radial tapper; late type.
CROSS #45 Tooth Gear Chamfering Machine.
FISCHER No. 1, Oil Groover; Late.
GROB OS-20 Metal Band Saw—Filer; M.D.
HUGH SMITH 1"x24'6" Plate bend. rolls M.D.
LeBLOND No. 2 Barrel Riffing Machine.
MANVILLE #2C Screw Slotter; Motor Drive.
MANVILLE #1 Screw Slotter; Motor Drive.
LANDIS 2" Dble. Spdle. Threaders; M.D.
LeBLOND #2 Barrel Lapper; M.D.; Late.
LIPE 8" Stands Chamfer; Late.
MICHIGAN #854 Gear Shaver; Late.
MANVILLE No. 3 Trimmers; Late.
MANVILLE No. 3C Thread Roller; M.D.
SAUNDERS 8-18" Pipe Machine; M.D.
US TOOL 310-B Cutter Reliever; Late.
WATERBURY FARREL No. 11 Thread Roller.
WEYBRIDGE Slitter; 36x22 gauge; NEW.

Send for Latest Catalog — ***Available for Prompt Shipment*** — ***Most Built After 1941***

MOREY
...for machine tools!

MOREY MACHINERY CO., INC.
Manufacturers • Merchants • Distributors
410 BROOME ST. • NEW YORK 13, N. Y.
TELEPHONE CANAL 6-7400
CABLE ADDRESS WOODWORK, N. Y.

HARVEY GOLDMAN PRESENTS

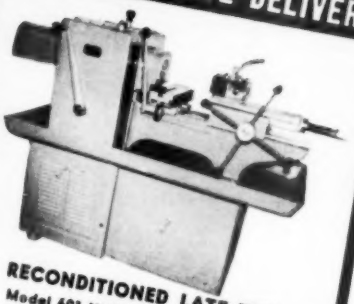
This Trade Mark Stands For:

- THE FINEST MACHINE TOOLS
- 3 GENERATIONS OF EXPERIENCE
- GUARANTEED SATISFACTION

CONSULT US WHEN YOU WANT THE BEST!

- AUTOMATICS
- BROACHES
- DRILLS
- GRINDERS
- LATHES
- MILLS
- PLANERS
- PRESSES
- SHAPERS
- MISCELLANEOUS

FOR IMMEDIATE DELIVERY



RECONDITIONED LATE TYPE
Model 601 W.D. Oster Turret Lathes
(Several)
For Bar and Chucking Work

A high speed, simplified machine capable of handling a wide variety of turret lathe work as efficiently as many more complicated and higher priced machines, and with less skilled operators.

HARVEY GOLDMAN & CO.

3910 SCHAEFER HIGHWAY • DEARBORN, MICHIGAN
TELEPHONE: TIFFANY 6-4450

THE FOCAL POINT FOR PRODUCTION MACHINERY

LATE MODEL MACHINE TOOLS . .

AUTOMATIC SCREW MACHINES
No. RA-4 1⅝" Acme-Gridley, 1943
2" Model A Cleveland, 1942
1 1/16" Model "A" Cleveland, 1943
No. RA-6 9/16" Acme-Gridley, 1942

AIR COMPRESSORS
75 HP Gardner-Denver Air Compressor

DRILLS RADIAL
3 11" Archdale Radial (English), 1942

GEAR EQUIPMENT
No. 7 Gleason "Revex" Rougher, 1943
No. 6 Gleason Revacycle Generator, 1940
No. 72 Fellows M.S. Gear Shaper, 1942
10" Pratt & Whitney Hyd. Gear Grinder, 1942
15" Red Ring External Gear Lapper, 1942
No. 7 LB Fellows Gear Lapper, 1944
Red Ring Universal Gear Checker, 1942
20M Fellows Red Liner Gear Tester, 1942
No. 12 Gleason Tool Sharpener, 1943

GRINDERS CYLINDRICAL
18"x72" Norton Plain Type "C", 1941
14"x108" Norton Plain Type "C", 1942
10-20x38" Norton Plain Type "C", 1942
14"x36 Landis Plain Type "C", 1943
12"x96" Fitchburg Plain Hyd. 1942
10"x18" Landis Plain Type "C", 1940

GRINDERS INTERNAL
No. 72AS Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1943
No. 10 CP 16 Bryant Hydraulic, 1942
No. 10-16 Bryant Hydraulic, 1942
No. 172 Heald Hydraulic Cap. 1940
No. 4 Bryant Internal, 1940

GRINDERS RADIUS
No. 73 Van Norman Radius Grinder, 1942

GRINDERS SURFACE
No. 22 Heald Rotary 22" Chuck, 1944

GRINDERS THREAD
No. 30A Excello Internal Thread Grinder, 1943
No. 31 Excello Precision Thread Grinder, 1942

GUN BARREL MACHINES
No. ½Bx50 Pratt & Whitney Rifler, 1942
No. ½Bx36 Pratt & Whitney Reamer, 1942
No. ½Bx30 Pratt & Whitney Reamer, 1942

HAMMERS
No. 2B Nazel Forging Hammer, 1942
200 lb. Bradley Helve Hammer, 1942

LATHES ENGINE
15"x200" American Geared Head, M.D.
27"x192" Niles "Timesaver" Lathe, 2 Carriages, New 1941
27"x90" Niles "Timesaver" Lathe, New 1940
26"x180" Betts Bridgeford Lathe, New 1940
26"x90" Betts Bridgeford Lathe, New 1940
25"x120" Lodge & Shipley Gap Lathe, New 1940
25"x120" Oldfield Schofield, New.
24"x120" Lodge & Shipley Cone.
14"x30" Bradford, 1942

LATHES PRODUCTION
No. 3FU Foster Fastermatic Platen Type, 1942
No. 5D Potter & Johnston Automatic, 1943
No. 4D Potter & Johnston Automatic, 1942
8"x84" Lo-Swing Semi Auto.
Lipe-Carbo-Matic Lathe, 1942

LATHES TURRET
24" Bullard Vertical, 1942
No. 3R Gisholt Universal Saddle Type, 1943
No. 4R Gisholt Universal Saddle Type, 1943
No. H3 Libby Universal Saddle Type, 1939
No. 5W Acme Universal Way Type, 1942
No. 4R Libby Universal Ram Type, 1942
No. 6R Denver Universal Ram Type, 1942
No. 3R Libby Universal Ram Type, 1942
No. 4 Gisholt Simplified, 1941
No. 1 Warner & Swasey Electric Head, 1940

MILLS TOOL ROOM
No. 4B Milwaukee Plain, M.D.
No. 3 Cincinnati Vertical, M.D.
No. 2G Kempsmith Universal, 1947
No. 2 Kempsmith Vertical Maximiller.
AL3 Alcora Plain Mill (No. 2 Size), New
No. 2 Rapid Universal Mill, New
FPN 2B Mathey Vertical Mill, New

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*

1961 S. Meridian St. . . Indianapolis, Indiana

MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

GOULD & EBERHARD 36" Gear Cutter M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

CINCINNATI 60"x48"x14' Planer. 4 heads, 1 extra side head on massive floor stand for open side work. M.D.

B & O #2 Turret Lathe 1" Cap. M.D.

FOOTE-BURT #25—24" Heavy duty Vert. Drill #5 M.T. Motorized.

GRINDERS—CYLINDRICAL. B & S #11, 7"x 32". Plain Grinder. Table swivels. Motorized with 4 motors.

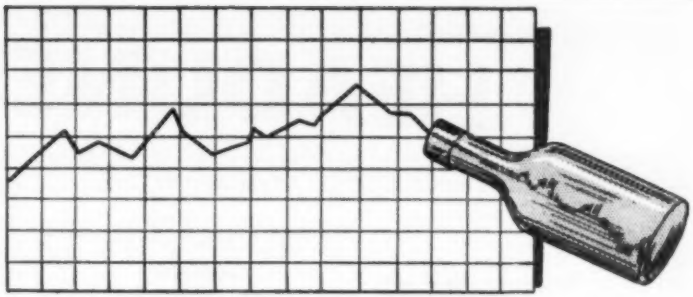
LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables. (PLANER SHAPER)

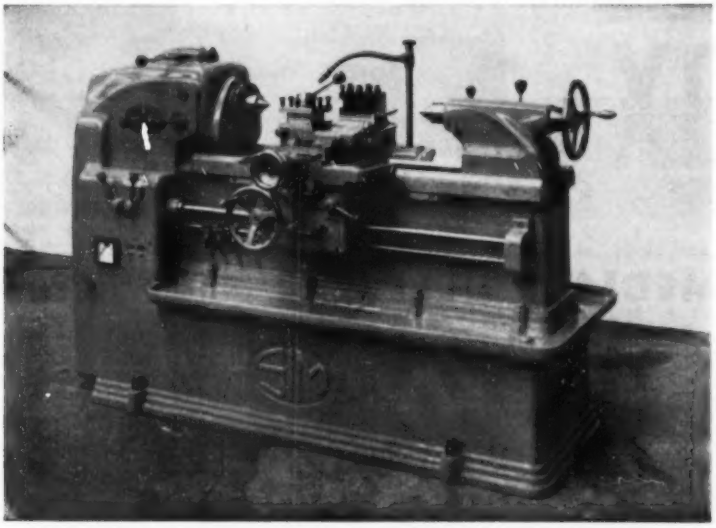
WE HAVE A LARGE STOCK FROM WHICH TO SELECT. TELL US WHAT YOU WANT.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88 Columbus 16, Ohio

Don't let the critical machine tool shortage "Bottleneck" your Production Plans



We offer you surplus new machinery—and we offer it without priority requirements and for immediate delivery.



SIM NEW MODEL TYPE T-4 PRODUCTION LATHE

These new type production lathes widely used in America. Swing 17". Distance between centers 24". American standards, dials. 10 H.P. motor. Spindle speeds 45 to 2000. 4 Adjustable automatic longitudinal feed stops, 4 Adjustable cross feed stops in forward motion and one in backward motion. Taper and forming attachment. Machine equipped with coolant pump, American standard spindle nose, four way tool post, all hardened and ground gears running in oil.

UNITED STATES IMPORTERS FOR: Berthiez, CWB, Ceruti, Sim and others, representing a complete line of machine tools to meet your requirements.

SOME TERRITORIES STILL OPEN FOR GOOD AGENTS.

NO PRIORITY NEEDED

WRITE . . . WIRE . . . PHONE . . . TODAY

If it's a Machine Tool Get the Best

INTERNATIONAL MERIT PRODUCTS CORP.

405 LEXINGTON AVE. NEW YORK 17, N. Y.

PHONE: MURRAY HILL 4-5443

Consult us on your Machine Tool Requirements

HEADLINERS

MILLING MACHINES

No. 2B Heavy Brown & Sharpe Plain
No. 3 Kempsmith & Universal, Lima Drive
No. 3A Brown & Sharpe Universal
No. 4 Cincinnati High Power Universal
No. 4B Heavy Brown & Sharpe Plain
48" Cincinnati Plain Automatic

LATHES

12"x84" centers American 12-speed Grd. Hd., taper
36"x96" centers Boye & Emmes, cone
24"x60" ctrs American Hvy. Pat. 12-speed Grd. Hd., taper
21"x136" ctrs LeBlond Hvy. Dty., Turner Drive, taper
20"x94" ctrs American Grd. Hd.
16"x30" ctrs Lodge & Shipley Selec. Grd. Hd.
14"x30" ctrs Lodge & Shipley Selec. Grd. Hd.

PLANERS

24"x24"x6' Gray, A.C. M.D.
36"x36"x10' Cincinnati, 2 hds., box table
42"x42"x14' Niles-Bement-Pond Hvy. Pat., box table, 4 heads
48"x48"x12' Niles-Bement-Pond, 4 heads
60"x60"x32' G.A. Gray, 4 heads, excellent

TURRET LATHES AND AUTOMATICS

1⅞" Cone 4-spindle Automatic, bar feed
3"x36" Jones & Lamson "Hartness" Turret, bar feed, lots tooling, clean

GRINDERS

20"x144" Landis Plain Self-cont., arr. m.d.
10"x24" Landis Plain Self-cont., m.d.
10"x24" Norton Plain, m.d.
6"x32" Norton Plain, m.d.
No. 49—53" Besly Vert. Spdle. Surface, m.d.
No. 5A Bryant Hydraulic Internal, late
No. 2 Norton Motor Driven Universal Tool & Cutter
No. 14-20 Gardner Opposed Type Disc

GEAR MACHINERY

#3-36 Brown & Sharpe, A.C. M.D.
No. 1 Adams Hobber, arr. m.d.
No. 2 Barber-Colman Hobber, m.d.
No. 5A Cincinnati 60"x16" Cutter
No. 12 Barber-Colman Hobber, m.d.
11" Gleason Str. Tooth Bevel Gear Generator
No. 18HM Gould & Eberhardt Double Spindle Hobber, s.p.d.
18" Gleason Str. Tooth Bevel Gear Generator, s.p.d.
18" Gleason Bevel Gear Tester
No. 7 Fellows High Speed Shaper, m.d.
No. 61 Fellows Gear Shaper, m.d.
12" Gleason Bevel Gear Planer, cone

PUNCH PRESSES

No. 2 VKV, O.B.I.
No. A4 Robinson O.B.I., m.d., 56-tons
No. 77 Toledo Open Back, b.d.
No. 2DT CANCO Deep Thrt. Horning m.d.
No. 5H Cleveland Horning, arr. m.d.

MISCELLANEOUS

10" Dill Slotter, m.d.
20", 24", 28" Gould & Eberhardt Shapers
No. 14½ W&W Punch & Shear
Clans F Bertsch Punch & Shear
18" Niles-Bement-Pond Slotter, cone
200 lb. Bradley Compact Hammer, b.d.
2½"-6" Cox Pipe Machine, m.d.
1½" Landis 2-spdl. Bolt Thrd., m.d.
2½" Landis Long Bed Stay Bolt Threader, cone, leadscrew

Send us your inquiries.

COX MACHINERY COMPANY, INC.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO
Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

IMMEDIATE DELIVERY

ROLLER LEVELLERS

McKAY ½" TO 2" FOUR-HIGH LEVELLER. 15" Diameter Rolls, (9) Leveling Rolls, (11) backing up rolls, (2) Pinching rolls, (1) 300 HP motor for main drive, (2) 10 HP motors for screw down and (1) 2 HP motor for pinch roll adjustment.

McKAY ¼" TO 2" TWO-HIGH LEVELLER. 13" Diameter Rolls, (11) Levelling rolls, (2) Pinching rolls, with (1) 150 HP motor for main drive, (2) 7½ HP motors for screw down.

ABOVE MACHINES ARE NEW IN 1943, SELLING FOR 1/5 OF NEW COST, USED ONLY 6 MONTHS

PUNCH PRESSES

525 TON, BLISS #410A DOUBLE ACTION TOGGLE. 25" stroke, 62" shut height of plunger, 17" stroke, 60" shut height of blankholder, 60 x 84 bed area.

255 TON, TOLEDO #98-D DOUBLE CRANK, STRAIGHT SIDE. 6" stroke, 30" shut height, 51 x 87" bed area.

180 TON, #70D CLEVELAND DOUBLE CRANK, STRAIGHT SIDE, 18" stroke, 32" shut height, 40x84" bed area.

125 TON, TOLEDO #5-36 TWIN TYPE O.B.I. PRESSES ON S.S. BASE. 3" stroke, 25 x 25" bed area, 12½" shut height.

88 TON, TOLEDO #93½ DOUBLE CRANK, GAP FRAME. 2¼" stroke, 38" x 53½" bed area, 9¼" shut height.

88 TON, BLISS #4D DOUBLE CRANK, GAP FRAME. 2¼" stroke, 38 x 53½" bed area, 9¼" shut height.

87 TON, BLISS #4½ STRAIGHT SIDE. 4½" stroke, 21 x 27 bed area, 14½" shut height.

75 TON, WELLS DOUBLE CRANK GAP FRAME. 2" stroke, 20 x 80" bed area, 11⅛" shut height.

65 TON, WALSH #65 BACK GEARED, O.B.I., BRAND NEW. 4½" stroke, 32¼" x 18½" bed area, 11" shut height.

60 TON, TOLEDO #203-E DOUBLE CRANK GAP FRAME. 4" stroke, 13 x 55½" bed area 16" shut height.

55 TON, WALSH #55 FLYWHEEL, O.B.I. BRAND NEW. 4" stroke, 32¼" x 18½" bed area, 9½" shut height.

MANY OTHER PRESSES IN STOCK FROM 5 TO 525 TON CAPACITY

PAUL'S MACHINERY CO.

6111 VERMONT AVE. TYLER 7-6300
DETROIT 8, MICH.

POWER PRESSES —HYDRAULIC

500 Ton Woods, 4 Column 7½" diam. Stroke 24", Daylight 48". Bed area 8' x 6' bet. columns. Diam. of Ram 23". 2 Pull backs 20½. Pump and motor.

350 Ton Southwark. 4 columns, 7" diam. Stroke 24", Daylight 76". Bed area 8' x 5' overall. Diam. of Ram 38". Air Cushion 60" x 56½". Less Pump and Motor.

Photos and details upon request

KINGS COUNTY MACHINERY EXCHANGE

408 Atlantic Ave., Brooklyn 17, N. Y.
Dept. "A" Phone: Triangle 5-5237

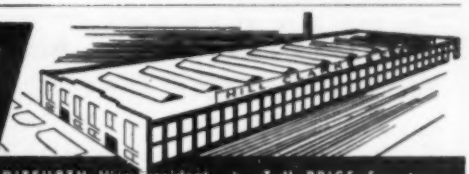
GRINDERS: Heald No. 73 Internal Centerless, S/N 17099. Heald No. 74 Internal Centerless S/N 24602. These two grinders are in excellent condition and are equal to new. Cinn. 1½ Cutter Grinder S/N A-612T w/extra attach's.

COLD HEADERS: No. 3 Waterbury Farrel Triple Stroke Open Die Toggle Header, S/N 23508: 3/16" Asa S. Cook Single Stroke Open Die Crank Header: 5/16" Asa S. Cook Single Stroke Open Die Crank Header. S/N 365.

THREAD ROLLERS: No. 20 Waterbury Farrel Horizontal Hand Feed S/N 215: ⅜" cap. Nat'l. Hyd. Hor. Hand Feed, 22 sets New Thread Roll Dies, Std. Sizes, 1944.

ED SMITH MACHINERY SALES
1529 Lillibridge Detroit 14, Mich
VA 2-4830

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

UNION SPECIAL MACHINE CO., largest industrial sewing machine manufacturers, has Hill-Clarke machines still in use after 33 years. Above, Chief Factory Supt. J. V. Carlson says, "We find Hill-Clarke the most reliable dealer in used machinery because of their years of experience and their superior facilities for accurately re-building machine tools."

ALSO CONSULT US ABOUT RE-BUILDING YOUR OWN MACHINES!

AUTOMATICS

¾" G Model Gridley
1-1/16" Model A Cleveland (1942)
1½" Foote Burt (1941)

DRILLS

1 Spdl—15" Sw—No. 2 Avey, Cam Fd.
1—Spdl—24" Sw—No. 2 MA6 Avey
2 Spdl—24" Sw—No. 2 Aveymatic
2 Spdl—24" Sw—No. 3 Avey
D-31 Fox Multiple Drill, No. 2 Taper.
6' Western Radial

GEAR MACHINES

No. 12-H Gould & Eberhardt Hobber
No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 612-A Fellows Gear Shaper
No. 615 Fellows Gear Shaper
No. 65 Fellows—Cone Dr.

BORING MACHINES

72" Niles—Hvy. Pattern

GRINDERS

6"x18" Norton Cylindrical (1943)
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
16"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
24"-32" Gap x 144" centers
No. A-3—12" Arter Rotary Surf.
5A Bryant Internal
5B Bryant Internal
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 71 Heald Centerless Internal
No. 81 Heald Int. Cen.-Sizematic
No. 74 Heald Internal Centerless
No. 44 Excello Carbide Tool Gdr.

LATHES

19"x8' LeBlond Hvy. Duty Lathe
20"x9' Chard Lathe
36"x18' Putnam Grd. Hd., M.D.
No. 4 Warner & Swasey Tur.-Bar Fd.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 4A Warner & Swasey—7½" Hole —Spdl.

MILLING MACHINES

6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)

PLANERS

36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati; 2 hds.
48"x48"x12' Gray Maxi-Service
48"x60"x27' American, 4 hds.

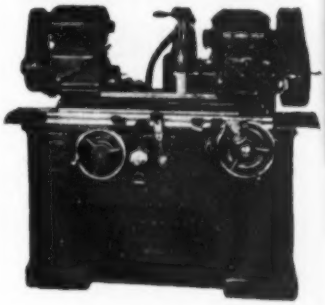
MISCELLANEOUS

2—12"x96" Magnetic Chucks
20'x1" cap Southwark Roll
14'x¾" cap Niles-B-Pond Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper
No. 200 Micro. Horiz. Hone, 1 Spdl.
No. H-2 Micro. Horiz. Hone, 2 Spdl.
Model 200—H5 Micro.—Horiz.—2 Sjdl.
14' Niles-Bement-Pond Roll
No. 6 R & K Straight-side Press, M.D.
42"-16 Ga. Economy Shear, M.D.
4-B Marvel Hack Saw
No. 5 Reynolds Power Screw Driver
No. 175 G. T. Schmidt Marking Mach.

Attention!

OF SPECIAL INTEREST

6" x 18" Norton Hydraulic Plain Cylindrical Grinder



FULL MONEY-BACK GUARANTEE

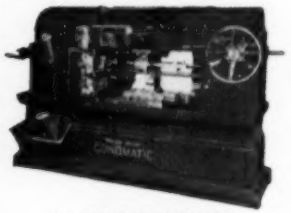
1. Hill-Clarke always give you an unconditional money-back guarantee.
2. All machines in stock.
3. You can see your machine run and tested under power in our plant before purchasing.
4. Complete and modern facilities plus experience craftsmen for RE-MANUFACTURING machine tools in our 50,000 sq. ft. plant.
5. A responsible organization—with eighty-five years experience.

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD • CHICAGO 6, ILL. PHONE Central 6-6200

RELIABILITY has been earned by WIGGLESWORTH MACHINE TOOLS

AUTOMATICS

2⅝" Cone, 4 spdle., well equipped, 1936
4½" Cone, 4 spdle., bar, late, excellent
#24 New Britain 4 spdle. chucker, 2½" cap.
¾" Model F Gridley, 4 spdle.
1¼" Billings & Spencer Dimatic Cutoff
#4 Brown & Sharp single spindle 2⅜", late



2" 4 SPINDLE CONEMATIC

BORING MILL

42" Bullard New Era, side and rail head
60" Bullard, 2 rail heads, all p.f.

GRINDERS

#33 Excello ext. groove, late type
#86-30" Gardner vert. disc grinder
14" WD Hammond dble. end, carbide
10x18" Landis type CH plain cylindrical
14x36" Norton C semi-auto., cyl.
73 Heald Internal Centerless
73 Heald Internal, 1944, like new
#76RA Rogers knife grinder, 76"
P & W deep hole drill grinder, late

Oliver single point tool
Model 1311 P & W contour, late
#106 Rivett Internal
5 HP Marschke, single end

DRILLS

4'11" Western radial, enclosed head
#12 Minster Jr., #5 M.T., box column
#2LMS Leland-Gifford, 26", hydraulic
#24 Footburt, 3 spdle., #5 M.T., 24"
#2 Allen, 2, 4, 6 spdle., #2 M.T.
36" Syndor single, #5 M.T.
#2 Detroit Semi-automatic, horiz.
Type 14 Natco 12 spindle
Model 4230 Bodine Drill & Tapper, 12 sta.
Moline Hole Hog, 2 spindle

GEAR MACHINERY

#13LS Fellows lapper
7A Fellows, shaper, high speed, hvy dty
61A Fellows, shaper, high speed precision

LATHES & TURRETS

30"x10' American geared head, taper att.
33" Niles vertical wheel, 1930
48" Niles vertical wheel, side and vert. head
#3 Morey Universal, air chuck, late
#1A W&S Univ., serial 260313
#2 Simmons Microspeed
#4 W&S, serial 327317
Hepburn Shell
Gishalt Simplimatic, platen type
40"x35' centers LeBlond Heavy Duty, geared head, 1940.

SHAPERS & PLANERS

24" Cinn. Universal shaper, late, rebuilt
48x48"x10' Gray dble. hsing., 3 heads
30"x36"x17' Cleve. Openside
48x48x14' Detrick & Harvey dble. hsg.
26" Smith & Mills shaper, 4 step cone
84"x84"x24' Gray, double housing, late

MILLS

#1½B K & T horiz., dble. overarm, rebuilt
#3 B & S vertical, geared head
#3 Sundstrand Rigidmill, horiz.
Briggs production, hydraulic
10C Van Norman Contour

THREADERS

#50 Excello Precision grinder, 28x68"
TG185 J & L internal grinder, 12 x 15"
13" Automatic Machinery miller, late
Model 40 Lees Bradner mill, 6½" hole
#2 Dalzen grinder, 3" o.d. cap., late
LT636 Lees Bradner mill, 18 x 36", late
1½" Landis, 2 spdle., lead screw type

FURNACES

Whiting Converter, 2 ton cap., late
Model SP Juthe, gas, 1000° F
Lithdraw heat treat, 1200° F, late

PRESSES

#12 Zeh & Hahnemann percussion, 150 ton
#3 Koehler OBI, 18 ton, 2" stroke
#78½ Bliss straight side, 350 ton, sgle. crank
Ferracute type EG-52 embossing, 150 ton
Lucas 50 ton straightening, 24½" stroke
#57 Toledo, 150 ton, s.s., s.c.
#4 Toledo OBI, 25 ton, 2" stroke
#2½ Niagara OBI, 45 ton, 2½" stroke
100 ton Niles wheel press

MISCELLANEOUS

SAW: #18 Marvel hack, 18 x 18", late
HAMMER: 4000# Erie Steam, sgle. frame, late
KEYSEATER: #6-38 Mitts & Merrill, 4 x 36"
SPINNING RIVETER: Grant 5 spdle.
LAPPERS: 86-36" Gardner, vert. spdle.
HAMMER: 300# Bradley Upright Helve
WELDERS: Hobart and P & H Arc, 400 amp.
BULLDOZERS: #2 Ajax High Speed, 30 ton

T. R. WIGGLESWORTH MACHINERY COMPANY
1719 SUPERIOR AVENUE • • • SUPERIOR 1-8727 • • • CLEVELAND 14, OHIO

SALE or RENTAL
INDUCTION HEATING EQUIPMENT

- Motor Generator Sets.
- Vacuum Tube Units.
- Spark Gap Types.

Various Sizes and Capacities.

•

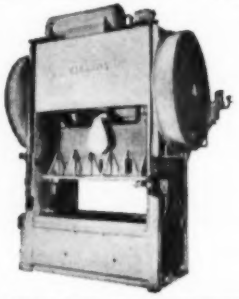
- Continuous Induction Slug Heating Fixture for Forging.

•

Write or wire for prices and details

NEW ROCHELLE TOOL CORP.
162 E. Main St. New Rochelle, N. Y.
Phone: New Rochelle 2-2330

WORLD'S LARGEST STOCK
STAMPING PRESSES
BLISS • CLEARING • CLEVELAND
FERRACUTE • HAMILTON • L & J
NIAGARA • TOLEDO • V & O



SQUARING SHEARS • PRESS BRAKES
REBUILT and GUARANTEED

JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
PHILADELPHIA 34, PA. Phone: REGENT 9-7727

MODERN MACHINES

Gould & Eberhardt Automatic Gear Hobber Serial #3234, Model 9KH—20"
#64 Fellows Gear Shaper, Ser. #28135
#61A Fellows Gear Shaper, Ser. #23434
9" American Radial Drill Ser. #55502
Lodge & Shipley Lathe #2905I 18" Jaw Chuck
Reed Prentice Engine Lathe
20" Hanchett Face Grinder
Baush Multiple Spindle Drill, Type W7
60 Potter & Johnson Automatic Chucking Machine
#30 Waterbury Farrell Thread Rollers
16" Gould & Eberhardt Shaper
(2) #3 Cincinnati Miller-Ser. A1884 B
5' Reed Prentice Radial Drill Serial #5121
Conrad Pin Router—Serial #2525
Rawbottom Cam Miller and Master

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St., Providence, R. I.

ALUMINUM SPOT WELDER

35 KVA TAYLOR-WINFIELD rocker arm aluminum hi-wave welder, 36" throat, 3/60/440 volt, used 90 days.

PRICE: $3,850.00

L. J. HOY
123 Nebraska Ave. Toledo 2, Ohio
Phone: Adams-1914

Walker No. 430-S Magnetic Chuck.
Hardinge Model MD-37 Lathe, ½" cap.
30" P & W 2-spin. Profiler, M.D.
H.P.M. 75-ton Hyd. Rivet Press.

D. E. DONY MACHINERY CO.
47 Laureiton Rd., Rochester 9, N. Y.

Air Compressors, 23 to 535 cu. ft.
Hammers, Power, DuPont 25-75 lb.
Header or Upsetter, 3" Ajax, M.D.
Lathe, 60"x25' centers, Mackintosh-Hemphill.
Planer 40"x40"x12' Gray, Spur Gear Drive.
Press, Trimming, No. 6 W & W, 225 ton.
Shaper-Planer, 28" Rockford, M.D.
Shear, 140"x¾" E. W. Bliss.

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

CINCINNATI HYDROMATIC HORIZONTAL PRODUCTION MILLING MACHINE

Table 24"x102" Model 56-72

LINN-SHANNON MACHINERY CO.
160 N. Halsted St Chicago 6, Ill.

1941-1952 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New), automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Reaming Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
LIDKOPING: Centerless (New)
NORTON: 10"x36" plain, hydraulic
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 16C16 Hole, Hydraulic
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7⅛"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—SURFACE

ARTER: A-1—8" Rotary
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"

HONING MACHINES

BARNES: No. 306H Vertical 24" Stroke
MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical
NORTON: No. 26 Hyprolaps, for flat work & cylindrical lapping
NORTON: 2Fx40" dia., for flat work

LATHES—PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
Reinecker Relieving Lathe, (new)
H.E.B: High production hydraulic duplicating and copying lathes (new)
LE BLOND: Regal, 15" swing x 42" centers
LODGE & SHIPLEY: #3A Duomatic, 25½" swing x 27" centers
PROGRESS: Geared head 16" to 30" swing (New)
TRIPLEX: 14" dia. x 40" centers Toolroom Lathes (new)
VDF New Engine Lathe 49" swing x 20' centers
VDF New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

WARNER & SWASEY 2A Turret Lathe
WARNER & SWASEY #3 Turret Lathe
HERBERT: #2, #4, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables of 36" dia.
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

PRESSES

GEN. FLEX: Screw Press, 3 ton

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)
WILLIAMS: 10' Pipe & Tube Cut-Off

SHAPERS

HERCULES: 16" & 22" Shapers (New)
KLOPP: 16" to 26½" Shapers (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: 40A Thread Miller
MURCHEY: #22 Horizontal threading and tapping machine, ⅛" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

CUT-OFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Pipe & Tube, 10" Williams
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
PRESS: Screw. Gen. Flex. 3 ton
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
PUNCH SHAPERS: Sentinel Shrewbury, Thiel type design (New)
SHAPERS: Klopp 16 to 26½" (New)
SHAPERS: Hercules 22" (New)
GRINDER: WICKMAN Optical Profile Form Grinder (New)
WIRE FORMING MACHINES: 4-slides (new)

INSPECTION INVITED — Telephone HAnover 2-4520

TRIPLEX MACHINE TOOL CORP.

75A West Street, New York 6, New York **Cable Address TRIMACTOOL**

MACHINE TOOL ENGINEERS SINCE 1919

HIGHLIGHTS IN MACHINE TOOL . . . Value BY MacDell

GRINDERS AND LAPPERS

CINCINNATI 10"x48" Plain Cylindrical Grinder, Servo infeed 1941

CINCINNATI 10"x36" Plain Cylindrical Grinder, Servo infeed 1942

HEALD 25A 24" Rotary Surface Grinder with chuck 1941

NORTON No. 26 Hyprolaps 1942 and 1938

DRILLS AND TAPPERS

BAUSCH Radial Arm Countersinker 66" Rotary Table 1942

AVEY #3 MA6 Six Spindle Drill Press Hand Feed 1941

LATHES, ENGINE AND PRODUCTION

AMERICAN 27"x10' CC, Engine Lathe, 11" Hollow Spindle

LEBLOND 17"x78" Centers Regal Lathe 1941

LODGE AND SHIPLEY Model 3A Duomatic, 1946

SENECA FALLS Model R-14 Low Swing Lathe 1942

DENVER 6.2 Air Chucking 1942

LATHES—TURRET

GISHOLT #5 Ram Type Universal with Air Chucking 1943

BARDONS AND OLIVER No. 2 Ram Type Turret Lathe 1942

MILLS

BROWN & SHARPE Model 2B High Speed Plain 1938

HACK Multi-Versal with Attachments 1945

No. 3 PLAN-O-MILL Thread with Extras 1945

GEAR EQUIPMENT

FELLOWS 61A Gear Shapers 1941

PRATT & WHITNEY 10" Hydraulic 2 wheel Gear Grinders (2) 1941

GLEASON No. 12 Tool Sharpener 1944

MISCELLANEOUS

NATIONAL 4" Upsetter Suspended Slides Back Stop

SOUTHWARK 20'x1" Pyramid Type Bending Roll Drop End Balance Bar

AMERICAN V2-6 Broach 1945

BAKEWELL No. 1 Tapper 1941

MacDell CORPORATION
1042 W. LAKE ST. • CHICAGO 7, ILL.

MACHINE TOOLS

BORING MILLS

36" BULLARD Vertical Turret Lathe

DRILLS

32" CINCINNATI BICKFORD Upright Drill
ES NATCO Multi. Spindle Drill—Hyd. table, 1942
No. 42S BAKER 6.6. Heavy Duty Drill
No. 2MB LELAND GIFFORD 4-spindle Drill

GEAR EQUIPMENT

No. 04 FELLOWS Gear Shaper
No. 72SA FELLOWS High Speed Gear Shaper
No. 12 FELLOWS Gear Shaver, 1943
No. 36BM GOULD & EBERHARDT Gear Roughor

LATHES

13"x18" MONARCH "Air Gage Tracer" Mono-Matic Lathe
14"x8' bed HENDEY Mod. ECM, M.D. Eng. Lathe
18"x30" MONARCH Model C Engine Lathe, '42
20"x10' LODGE & SHIPLEY Selective Geared Head Lathe
30"x10' bed AMERICAN "High Duty" Geared Head Lathe
42"x15' AMERICAN Geared Head Lathe.

GRINDERS

6"x18" LANDIS Type C Plain Grinder
8"x18" CINCINNATI PF, Saddle Type Grinder
8x18" NORTON Vert. Spindle Surface Grinder
10"x72" LANDIS Type C Hyd. Plain Grinder, '42
#104 RIVETT Internal External Grinder
18/20 BRYANT Hyd. Internal Grinder
#75 HEALD Internal Centerless Grinders
TG-18S J&L Internal Thread Grinder
#50 HEALD Cylinder Grinder
10"x24" LANDIS Universal Grinder

MILLERS

No. 0-8 CINCINNATI (OT) Vert. Milling Machine
4½"x30" P&W Model C Thread Miller
#1 - 8 KENT OWENS M.D. Prod. Millr.
Model NMS U.S. Multi-Miller
#4 CINCINNATI High Power Vertical Miller.

AUTO. LATHES & TURRETS

No. 4D & 8S P&J Auto. Lathes
Nat. S JONES & LAMBON Ram Type Univ. Turret Lathe
No. 1HS LIBBY Heavy Duty Turret Lathe
No. 1L GISHOLT Saddle Type Turret Lathe, 1939
#2 WAS Geared Friction Head Turret Lathe

MISCELLANEOUS

No. 2 B&B Wire Feed Hand Screw Machine
15" BETTS Vertical Slotter
½B P&W 2-spindle Reaming Machine
9" TAYLOR & FENN Spline Miller
28" CINCINNATI Hand Feed Rotary Table
P&W Upright Shaving Machine
24x24x8' GRAY Double Housing Planer
24" CINCINNATI Standard Universal Shaper
36" NORTON Draw Cut Shapers

WIGGLESWORTH INDUSTRIAL CORP.
283 BENT ST. CAMBRIDGE 41, MASS. KIRKLAND 7-5242

AUTOMATICS

1½"—8 Conomatic, MD., 1941
1⅝"—8 Conomatic, MD., 1943

GRINDERS

#33 Excello Thread Grinder with motors, cam dresser and taper. Serial 4998. (war finish.)
#16—16" Bryant Internal Grinder with motors. (late model.)

PIPE & NIPPLE MACHINE

2" Landis Double Head, MD., 1950.

GALBREATH MACHINERY CO.
Empire Building, Pittsburgh, Pa.

FOR SALE

New Inclinable Presses For Metal Stamping

American Can Company offers for sale a number of new inclinable presses for metal stamping. Canco's own make, ranging from 11- to 48-ton capacity.

Inquire of:
AMERICAN CAN COMPANY
Equipment Division
100 Park Avenue, N. Y. 17, N. Y.

For Sale
Wheel Presses

250-300-400-600 ton
Caldwell-
Niles Bement Pond

FS-3776
AMERICAN MACHINIST
330 W. 42 STREET
NEW YORK 36, NEW YORK

1—Libby type C-24-4½, 24" swing x 9'2" bed turret lathe, #125, power feed to cross slide and turret, flat belt motor drive with idler, 4½" hole in spindle geared head, rapid traverse to turret.
PRICE $2,000.00

1—Lodge & Shipley 31" actual swing x 16' engine lathe, geared head V-belt motor drive, quick change gears, 7" spindle hole, back geared, friction clutch.
PRICE $1,400.00

1—Niles-Bement-Pond 36" vertical boring mill, #14583, 4-jaw chuck, 2 rail heads, motorized raising device, V belt motor drive.
PRICE $4,500.00

THE SANDERSON CYCLONE DRILL CO.
ORVILLE, OHIO

MACHINERY FOR SALE

One Heald Sizematic Internal Grinder No. 72A-3 with cross slide facing attachment. Two Gleason 12" straight cut bevel gear generators guaranteed in perfect condition. Two Fellows gear shapers Type 615A.

FS-4206, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

FOR SALE
AVEY 3 SPINDLE DRILL PRESS
SERIAL #19061
EXCELLENT CONDITION
WINSTON MACHINERY CO., INC.
326 W. OHIO ST., INDIANAPOLIS, IND.

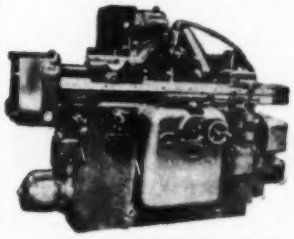
NEW and LATEST TYPE REBUILT MACHINE TOOLS FOR SALE or LEASE

LAPPING MACHINES

ULTRALAP Model 10 Vert. Lapper

LATHES

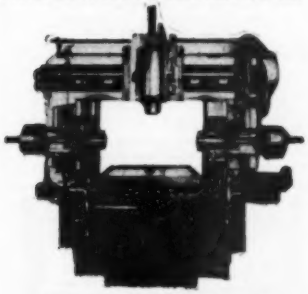
SOUTH BEND 10"x36" S.C.G. Engine Lathe 1" Cap.
MONARCH Model EE 18"x28" Toolroom
NEW LOCAN 11"x30" CC 1" Cap.
MONARCH Model N G.H. Engine Lathe 33½"x120" cc
LODGE & SHIPLEY G.H. Engine Lathe 24"-27"x16' cc
AMERICAN G.H. Engine Lathe 24"-27"x90" cc
AXELSON G.H. 24-Sp. Engine Lathe 19"x54" cc
LEHMANN G.H. 16-Sp. Engine Lathe 16"-20"x82" cc
AMERICAN G.H. Engine Lathe 10"-18½"x30" cc
MONARCH Model 5T Multi-Tool Mfg. Lathe 12"x18" cc
HARDINGE 2nd Operation Lathe 1" Cap.
CARROLL-JAMIESON 16"x8' G.H. 12-Speed Lathe



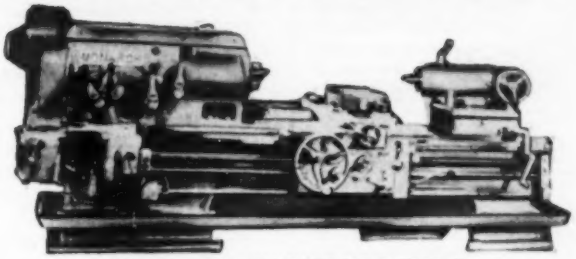
JONES & LAMSON MODEL TG 12 x 48"
AUTOMATIC THREAD GRINDER

TURRET LATHES

WARNER & SWASEY Mod 2 G.H. Ram Type 1" Cap.
WARNER & SWASEY Mod 2 G.H. Ram Type 1⅛" Cap.
BARDONS & OLIVER Mod 2 G.H. Ram Type 1" Cap.
BARDONS & OLIVER Mod 3 G.H. Ram Type 1⅛" Cap.
WARNER & SWASEY Mod 3 G.H. Ram Type 1⅛" Cap.
GISHOLT Mod 3 G.H. Ram Type 1⅛" Cap.
LIBBY Mod 4R G.H. Ram Type 2" Cap.
BARDONS & OLIVER Mod 5 G.H. Ram Type 2" Cap.
WARNER & SWASEY Mod 5 G.H. Ram Type 2⅛" Cap.
GISHOLT Mod 5 G.H. Ram Type 2⅛" Cap.
FOSTER Mod 1B Univ. G.H. Saddle Type 2-9/16" Cap.



P&W 40" VERTICAL MILLER AND
PROFILER—WITH TWO SIDE HEADS



MONARCH 33½" x 120" ENGINE LATHE—MODEL N

AUTOMATICS

BROWN & SHARPE Model 00G ¾" Cap.
CLEVELAND Model A Single Spindle 9/16" Cap.
CLEVELAND Model A Single Spindle 1-1/16" Cap.
CLEVELAND Model A 1¼" Cap.
CLEVELAND Model B Single Spindle 1½"—1⅝" Cap.

BORE-MATICS

EXCELLO Model 2112A Single End Double Spindle Hyd. Cross Slide Table
HEALD Model 46A

DRILLS

NEW G. M. S. R. Type T.B. 2 Radial 4'x12" Column
NEW ZEWO Universal Floor Type Radial 21"x½"
NEW CANEDY OTTO 18" Single Spindle ⅞" Cap.
NEW FAMCO 15" Bench Type Drill Presses ½" Cap.
NEW FAMCO 15" Floor Type Drill Presses ½" Cap.
MORRIS MOR-SPEED RADIAL 3'x9" Column
LELAND GIFFORD 2 Spindle

GEAR EQUIPMENT

BARBER-COLMAN Type G Hobber
FELLOWS 3" Fine Pitch Shaper
GLEASON 12" Straight Bevel Generator—Finisher—Roughor
GLEASON 3" Straight Bevel Generator
GLEASON 3" Spiral Bevel Gear Generator
GLEASON 3" Bevel Gear Tester
GLEASON Model G Angular Hypoid Tester
GLEASON 10" Spiral Bevel Generator
BARBER-COLMAN Model 12 Hobber 12" Cap.
BARBER-COLMAN No. 3 Precision Hobber

GRINDERS

BROWN & SHARPE Model 2 Internal-External Universal Grinder 14"x30" Cap.
CINCINNATI Univ. Hyd. Cyl. Int.-Ext. Grinder 12"x 30" Cap.
NORTON Model C Hydr. Plain Cyl. Grinder 6"x30" Cap.
THOMPSON Model F Hydr. Surface Grinder 8"x18" Cap.
ROTOREX Model 101-A Universal T & C Grinder, w/Int. Att.
COVEL Model 81A Univ. T & C Grinder
JONES & LAMSON Model TG-12x48" Auto. Thread Grinder
EXCELLO Model 35 Thread Grinder
EXCELLO Model 51 Thread Grinder

MILLING MACHINES (Horizontal)

VAN NORMAN Model 36 Ram Type Duplex
VAN NORMAN Model 22L Ram Type Duplex
NEW CENTEC Model 2A Universal With Vert. Att.
BROWN & SHARPE Model 3B Heavy Plain
MILWAUKEE Mod 5B Plain
SUNDSTRAND Rightmill Bed Type Production
BROWN & SHARPE Mod 1B Auto. Production Miller Auto. Cycle
CINCINNATI Mod 00 Plain Horiz. Auto., Auto Cycle

MILLING MACHINES (Thread)

PRATT & WHITNEY Model C-M-1886 Thread Miller 6"x36"
HANSON & WHITNEY Univ. Semi-Auto. Thread Miller 10"x48"

MISCELLANEOUS

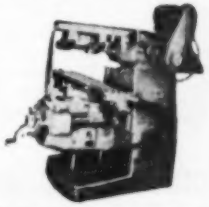
FAMCO #4, 8, 10, 12, 15 Foot Presses (NEW)
EXCELSIOR #4, 8, 10, 12, 18 Foot Presses (NEW)
ARBOR PRESSES (NEW)

VERTICAL MILLERS AND JIG BORERS

KNIGHT Model 3B Univ. Vert. Miller
MILWAUKEE Model 3 Vertical Miller
BROWN & SHARPE Model 2 Vertical Light Type Miller
CORTON Model 8D Super Speed Vertical Miller
CLEVELAND Model 1 Vertical Miller

PRESSES

WIEDEMANN Model R11P 18 Sta. Power Turret Punch
RUESCH #2 Percussion Press



NO. 36 VAN NORMAN MILLING MACHINE

PROFILERS

PRATT & WHITNEY 40-inch Profiler 2 Side Heads
PRATT & WHITNEY 30" Single Spindle

SAWS

PEERLESS Universal Hack Saw 6"x8"
NEW FAMCO Model 612 Horiz. Band Saws 6"x12"

SHAPERS

HENDEY Universal N.S. Crank Shaper 12"
GOULD & EBERHARDT Industrial Shaper 20"

SHEARS

COLUMBIA 92"x¼" Cap. 18" Gap Power Shear

TAPPING MACHINES

BAKEWELL Model 2 Tapper ½"—2½" cap.

MACHINERY RENTALS, INC.

197-199 MOTT STREET NEW YORK 12, N.Y.
PHONE: WORTH 4-7615

Plan Your Production with these Botwinik Values!

SPECIAL

Bertsch 18'x15½" Pyramid Type Bending Roll—Top roll 25" dia.—Bottom rolls 19" dia.—Drop-end type—100 HP main drive and 50 HP adjusting motors—1945 machine

BORING MILLS

Landis 4" bar Horizontal Floor Type—Plain 12'x6' —Vertical traverse 54"—Outboard support—MD

Detrick & Harvey 5" bar Horizontal Floor Type—Universal table—Vertical traverse 60"—Outboard support—MD

Betts 6" Vertical—Swing 106"—60" under cross rail —2 swivel heads—MD

Cincinnati 10' Vertical—Massive Type—Swing 124" —2 swivel heads—MD

Bullard Model 2-11 Mult-Au-Matic—Lead screw type — Double indexing — Considerable tooling — Late type—Ideal for 75mm and 81mm shells

DRILLS—RADIAL

Fosdick 5'14"—Box table—Tumbler gear box—MD

Cincinnati-Bickford 7'22" Master Type—Box table —24 speed head—MD

LATHES

Hendey 14"x30" otrs Geared Head—Taper attach—Micrometer carriage stop—MD

Hendey 16"x8' Geared Head—Pan bed—Taper attach—MD

Pratt & Whitney 10"x120" Model B Geared Head —Motor-in-base—Tooling

Reed-Prentice 16"x8' Geared Head—Taper attach—Motor-in base

Lodge & Shipley 24"x12' Geared head—Taper attach—Threading dial—MD

Betts-Bridgeford 50"x30' Geared Head — 21½" centers — MD

PLANERS

Liberty 36"x30"x8' Openside—1 rail & 1 side head—MD

Gray 36"x36"x8' Openside—1 rail & 1 side head—Helical gear drive—Reversible motor drive

Betts 72"x72"x24' Double Housing—Power rapid traverse—2 rail & 2 side heads—MD

PRESSES

Lempco High Speed—3" stroke—1000 strokes per minute—Die space 18"x18¼"—MD—Very late type

Ferracute Model P-3, P-4 and P-5 Power Punching —Front shaft supports— Direct motor drives

Bliss #306 Straight Side—Tie rod frame—1½" stroke—Bed area 28"x20"—135 ton cap.—MD

Beatty No. 11B Heavy Duty Punch—350 ton ram pressure—Stroke 3"—Ram adaptor plate—MD—Late Type

This is only a partial listing of our huge stock of Machine Tools of every make and description.

Send for our free catalog "The Plant That Answers 1001 Machine Tool Problems".

Botwinik Brothers of Mass. Inc

AUTOMATICS, Nos. 00G & 2B B. & S., '50
AUTOMATIC, 1¼" 4 spin. Gridley Model G
BOLT THREADERS, 1½" Williams Reliance
BOLT THREADER, 2" Landis, 2 Hds., M.D.
BORING MILL, 100" Cinci. Massive, 2 Hds., M.D.
BORING MILL, 60" Colburn PBT, 2 Hds. M.D.
BORING MILL, 72" King, 2 Hds., P.B.T., M.D.
BORING MILL, 9" bar Betts Floor Type, with 9'x10' plate
BORING MILL, 4½" bar Lucas #33 Tbl.
BORING MILL, 4½" bar P. & H. #9 Floor Type
BORING MACH., 3" Bar Lucas & Lambert (2)
DRILLS, RADIAL, 4' Western, M.D. (2)
6' Amer. 19" col. Trip. Purp., M-on-arm
4'15" col. Carlton, M-on-arm, Late
5' Amer. 19" col. Trip. Purp. M-on-arm
5 Niles #19 Rightline, Univ., Motor on arm
5' Amer. 14" col. Trip. Purp.
TABLES, RADIAL 36"x20"x20"
DRILL, 24" Cinci Bick., Tapping, M.D.
DRILL, No. 121 Baker, M.D.
DRILL, 16 Spin. Natco, C15-R
DRILLS 21" Royersford Excelsior M.D. New
GEAR HOBBER, No. 12 Barber Colman
GEAR HOBBER, No. 9481 Gould & Eberhardt
GEAR PLANERS, 11" Rivacoker Gould
GEAR SHAPERS, Nos. 5, 5A, 5A & 5½A
GEAR SHAPER, No. 75 Fellows
GEAR CUTTER, No. 13 B. & S. Spur & Bevel
GRINDER, FACE, 84" Builders, 40 h.p.
GRINDER, 16"48 Bryant Int., 1940
GRINDER, Micro Internal, large capty.
GRINDER, No. 75A Heald Internal
GRINDER, SURFACE 14"x36" P. & W.
GRINDER, No. 6T Sellers Tool 1942
HAMMER, 1000 lb. Chambersburg Pneumatic, 1947
LATHES, 46"x20' bed, Amer. T.A. Grd. Hd.
42"x16' con. Putnam Grd. Hd., M.D.
26/46"x24' bed Modern, Dble. Spin. M.D.
24/46"x16' bed Fay & Scott Gap M.D.
36"x22' con. Bridgeford, 2 carr. M.D.
32"x14' bed Shumacher Gaps T.A., M.D.
24"x12' bed B. & E., T.A., Grd. Hd.
16/32"x8' Harrington Gap M.D.
18"x10' bed L. & S., T.A., Cone Motorized
18"x8' bed L. & S. Selective Grd. Hd., M.D.
16"x6' & 12"x6' Hendeys (2)
14"x30" con. Monarch T.A., 16½" sw.
14"x8' bed, Amer. T.A. M-in-base
TURRET LA., 2" Jones & Lamson, late
TURRET LA., 10" Libby Model A Grd. Hd.
No. 2B Foster Univ., 3½" capty., Bar Tinken
No. 1B Foster Univ., 2" capty. M.D.
No. 00 Oster 1½", New
No. 3AL Gisholt, 6½" M.S.
No. 3 Gisholt, '42 (5)
MILLER, No. 5-48 Cinci. Hydromatic Pl. M.D.
THREAD MILLER, 12"x80" Morey Shields '42
MILLER, No. 4B B. & S. Plain M.D.
MILLER, No. 0 Sundstrand Rigidmil, Hand
MILLER, No. 1½B K. & T. Univ., Grd. Hd.
MILLER, No. 3 Cinci. HI Power, Motorized
MILLER, No. 4 Cinci. Univ. HI Power, M.D.
MILLER, No. 30H Sundstrand Rigidmil, 33" feed
MILLER, No. 2 Van Norman Ram, M.D.
PIPE THREADER, 2" Landis, Grd. Hd., M.D.
PRESS, 73½ Bliss S.S., 9" stroke
PRESS, No. 58 Toledo S.S., Grd., 171 ton capty.
PLANER, 24"x24"x5' Gray, M.D.
PUNCH & SHEAR, No. 7 Ryerson-Kling with corner 1-5/16" to 14 gauge.
SLOTTER, 24" Betts, 40" Tbl. M.D.

BENNETT MACHINERY CO.
375 Allwood Road, Clifton, N. J.
Off Route 5-3, Phone Prescott 9-8996
New York Phone: LOngacre 5-1222

72" BULLARD

10 x 18 cin. O.D. grinder, plunge cut, late.

3 spindle Avey drill, motor spindle PF and tapping.

No. 4 OBI Federal press.

No. 12 LeBlonde automatic lathe.

Cincinnati type tool and cutter grinder—new.

SURPLUS MACHINE TOOL & EQUIPMENT CO.

➡ SCARCE MACHINE TOOLS ⬅

NILES 19' Vert. Boring Mill, 2 Heads, M.D.

INGERSOLL Planer Type Mill, 4 Heads, 36" x 24" x 20'

CINCINNATI 36" x 36" x 16' Planer, M.D.

WOODWARD & POWELL 42" x 42" x 36' Planer, M.D.

HEALD #81 Centerless Internal Grinder

HEALD #22 Rotary Surface Grinders

National Machinery Exchange
138 Mott St. New York 13, N. Y.
"If It's Machinery, We Have It"

REFRIGERATION UNITS

Two Practically New Worthington Carbondale Refrigeration Compressors

300 Ton Freon

Ideal for large plant or office building

WILL SACRIFICE

WINSTON MACHINERY CO., INC.
326 WEST OHIO STREET
INDIANAPOLIS, INDIANA

MONTHLY BARGAINS

BARNES HONE

Model 172, Serial No. 2104, #3 M.T. 32" ways. Hydraulic reciprocating spindle. Motor 3 speed 220/440v.

Fellows, #72 Gear Shaper, High Speed, Type 7, Serial No. 21348, Motor and controls 220/440. Reconditioned.

Bryant, #16-CP-16" Hydraulic Hole Grinder, Serial No. P-6831, Mfg. 1943. "C"—Heavy Duty; "P" — Plain Bearings on Work Spindle.

FOSTER MACHINERY SALES CO.
18800 Hawthorne, Detroit 3, Mich.

ELECTRIC FURNACE TO 1850°

8 x 12 x 15 inside with Auto. Temperature Control 4.5 K.W. Sliding door, cheap to operate. Substantial, Dependable for Machine Shop—Tool Room. New. $250.

E. H. WILLIAMS
BOX 9042A, HUNTINGTON, W. VA.

BROACHES—Late Type

Colonial Vertical Surface 10 ton 66"
Colonial Vertical Surface 12 ton 60"
Colonial Vertical Pull Down 15 ton 48"
Colonial Horizontal Universal 10 ton 60"
American Vertical Pull Up 35 ton 42"

MISCELLANEOUS

Sleeper & Hartley #5 Universal Coiler
#3 Baird 4-Slide Forming Machine
Lester 6 oz. Injection Molding Machine

AMCO
MACHINERY COMPANY
125 Leib St. Detroit 7, Mich.

Westinghouse Electric Hardening Furnace, pusher type, for 16" breech blocks. Range 0 degrees to 1800 degrees.

W. C. COWDEN MACHINERY CO.
Syracuse 4, N. Y.

MACHINERY FOR SALE
ATTENTION EXPORTERS

Unusual opportunity to procure modern Fellows Gear Shapers 615A and 645 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt, Rougher, #7 Fellows Gear Shaper, #16 D. E. Whiton Machine. Write for full information.

FS-1683, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

FOR SALE—DEL. FROM STOCK
NO PRIORITIES
NEW GERMAN MACHINE TOOLS

Lathes, Shapers, Centerless Grinder, Tool & Cutter Grinders, Radial Drills.

Write for information & prices to
FS-4697, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

MOTORS, GENERATORS, TRANSFORMERS

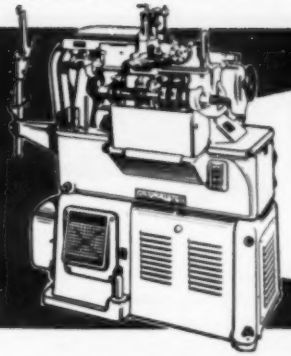
1 — 1500 H.P.
Bought and Sold
New and Rebuilt

ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

New "SEARCHLIGHT" Advertisements

received by 10 A. M. Monday, August 4th, will appear in the August 18th issue, subject to space limitations.

Classified Advertising Division
AMERICAN MACHINIST
330 West 42nd St., New York 36, N. Y.



Beaver·Bilt

BROWN & SHARPE AUTOMATIC SCREW MACHINES

Not Just Rebuilt . . . . But Beaver-Bilt

Beaver-Bilt Brown & Sharpe machines are *unconditionally guaranteed* to produce work to the same tolerances as new machines. Only genuine B & S replacement parts are used and no change is made from standard.

THE FOLLOWING LATE TYPE HIGH SPEED BROWN & SHARPE AUTOMATIC SCREW MACHINES ARE NOW IN STOCK FOR IMMEDIATE DELIVERY

2—No. OO H.S. Serial Nos. 13408 and 13883 (1938); Swing Stop, ¼" Spindle Cap., 6000 R.P.M. Spindle Speed, New Turner Motor Drives. Beaver-Bilt.

2—No. OO H.S. Serial Nos. 17101 and 17102 (1943); Swing Stop, Screw Slotting Attachment, ⅛" Spindle Cap., 6000 R.P.M. Spindle Speed, New Turner Motor Drives. Beaver-Bilt.

1—No. OOG H.S. Serial No. 14662 (1940); Swing Stop, Screw Slotting Attachment ⅛" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

2—No. OOG H.S. Serial Nos. 15067 and 16064 (1942); Swing Stop, Vertical Cutoff Slide, ⅛" Spindle Cap., 6000 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

2—No. O H.S. Serial Nos. 8094 and 9675 (1940); Swing Stop, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, New Turner Motor Drive. Beaver-Bilt.

1—No. OG H.S. Serial No. 8891 (1940); Swing Stop, Vertical Cutoff Slide, Screw Slotting Attachment, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

2—No. OG H.S. Serial Nos. 10,000 and 11,000 (1943); Swing Stop, Vertical Cutoff Slide, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

1—No. OG H.S. Serial No. 12941 (1945); Swing Stop, Screw Slotting Attachment, ¾" Spindle Cap., 4150 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

2—No. 2 H.S. Serial Nos. 7404 and 7405 (1937); Swing Stop, Vertical Cutoff Slide, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, New Turner Motor Drive. Beaver-Bilt.

1—No. 2G H.S. Serial No. 7519 (1937); Swing Stop, Vertical Cutoff Slide, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

2—No. 2G H.S. Serial Nos. 7524 and 7525 (1937); Swing Stop, Vertical Cutoff Slide, Screw Slotting Attachment, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

2—No. 2G H.S. Serial Nos. 11842 and 12648 (1945); Swing Stop, Vertical Cutoff Slide, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

1—No. 2G H.S. Serial No. 12355 (1945); Swing Stop, Vertical Cutoff Slide, Screw Slotting Attachment, 1¼" Spindle Cap., 3000 R.P.M. Spindle Speed, Motor in Base. Beaver-Bilt.

TRADE-IN SPECIALS IN GOOD OPERATING CONDITION

1—No. OO Standard Brown & Sharpe Automatic Screw Machine, Serial No. 2658 complete with standard equipment. Very good operating condition.

1—No. OO H.S. Brown & Sharpe Automatic Screw Machine, Serial No. 12213, complete with Swing Stop, and Turner Motor Drive, and standard equipment. This machine is in excellent condition.

3—No. OOG H.S. Brown &Sharpe Automatic Screw Machines, Serial Nos. 10310, 11377, and 12123, with Swing Stops, Motors in base, and standard equipment. Machines are in excellent condition.

1—No. OOG H.S. Brown & Sharpe Automatic Screw Threading Machine; Serial No. 16024, with Screw Slotting Attachment and Motor in base. In excellent operating condition.

1—No. O Standard Brown & Sharpe Automatic Turret Forming Screw Machine, Serial No. 5698, complete with Motor Drive. Good Condition.

1—No. 2 Standard Brown & Sharpe Automatic Turret Forming Screw Machine, Serial No. 541. Fair Condition.

1—No. 2 Standard Brown & Sharpe Automatic Screw Machine, Serial No. 4514, with standard equipment. Fair Condition.

OTHER FINE MACHINE TOOLS IN EXCELLENT CONDITION

21—Elgin and Hardinge Second Operation Spindle Head Stocks only, with Bronze Bearings, Three Step Cone Pulleys, ¼" Collet Capacity with Draw Bars.
Price for lot for quick sale .....$210 NET

1—No. 2 Cam Haskins High Speed Production Tapping Machine, Serial No. T-9721, New in 1944, and in excellent condition.

6—Lipe-Rollway Pneumatic Bar Feeds, Model 56A, Serials from 255 to 366. For No. 00 Brown & Sharpe Automatic Screw Machines. These Bar Feeds are in excellent condition.
Price .....$150.00 each. NET

1—Motor Driven Burring Attachment for No. 2G Brown & Sharpe Automatic Screw Machine. In excellent condition. Price .....$500 NET

BEAVER UNCONDITIONAL GUARANTEE

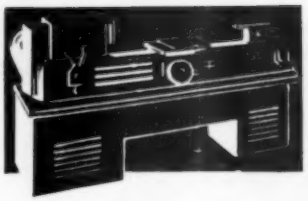
Any Beaver-Bilt or "as is" machine sold by us can be operated in your own shop for a period of 30 days and, if found unsatisfactory for any reason whatsoever, may be returned freight prepaid for a full refund of the purchase price.

USED AND BEAVER-BILT MACHINERY DIVISION — PHONE: SEeley 3-0680

Beaver Industries

1500 WEST ADAMS STREET, CHICAGO 7, ILLINOIS

Confidence in a dealer is earned by years of dependable service



● Customer confidence in Motch & Merryweather is something that has been earned during 45 years of dependable service to the Metalworking Industry.

The wide scope of Motch & Merryweather's operations—as builders of machine tools—as sales representatives for a large number of prominent machine tool builders—and as dealers of used, reconditioned, and rebuilt machines qualifies us as a reliable source of supply.

This confidence is reflected in the complete service we are performing in the national defense effort. Our plant being fully occupied in defense work, we cannot in justice to you invite inquiries requiring immediate deliveries even though we have a very limited supply of good rebuilt machines available.

However, we want you to know how much we appreciate your past business, your patience, your good-will, and to assure you that when this emergency is over we will again be glad to serve you with the same high quality of rebuilt machine tools that you expect from us.

Always find out first what Motch & Merryweather has to offer!

THE MOTCH & MERRYWEATHER MACHINERY CO
CLEVELAND DETROIT CINCINNATI PITTSBURGH

USED MACHINERY DIVISION 1250 EAST 222ND STREET EUCLID 17 • OHIO

BROWN & SHARPE Automatics (several)
#12 Martin Hydraulic Marking Machine, M.D.
#3 LODGE & SHIPLEY Duomatic Lathe
BAIRD Cut & Carry Drawing Press
4" RICE BARTON SPLINE MILLER
20" HENDEY Heavy Duty Shaper
22x8x12" ABRASIVE SURFACE GRINDER
DIAL FEED POWER PRESSES
SHELL THREAD ROLLERS
#10 W.F.F. Thread Rollers
36" ESPEN-LUCAS Hydraulic Cold Saw
Numerous Other Machine Tools

CURRIER MACHINE SALES
1055 State Street, P. O. Box 1503
New Haven, Conn.

UNIVERSAL TOOL & CUTTER GRINDER

Vernon Late Model. Motorized Headstock. Table 28" x 5½". Swing 10". Head Swivel 360°. Table Swivel 90°. Complete with 2 motors, 3 jaw & 4 jaw chucks, Internal Grinding also Dresser Attachment. Serial 7072. Good condition. Priced to sell.

BOICE-CRANE CO.
930 Central, Toledo 6, Ohio

FOR SALE
NATIONAL BROACH 18" Internal Gear Shaver Serial No. GC1461.

WALTER H. MEYER
MACHINERY & EQUIPMENT CO.
605 W. Washington Blvd. Chicago 6, Ill.

PRODUCTION LATHE
14" x 48" MONARCH MAGNAMATIC PRODUCTION LATHE
Excellent Condition
WINSTON MACHINERY CO., INC.
326 W. OHIO ST., INDIANAPOLIS, IND.

TIME TESTED TOOL DESIGNERS

- In Business Twelve Years.
- Approximately 100 Competent Engineers—experience and know-how welded into a Flexible Team.

SPECIALIZING IN:
Jet Engine Tooling — Boring Machine Tooling

References from Largest Manufacturing Concerns in Industry.

ASSOCIATED TOOL DESIGNERS

Send for free illustrated brochure.

Our representatives will call personally in answer to your request.

1610 S. Woodward • Birmingham, Michigan • Midwest 4-3920
MEMBER, NATIONAL ASSOCIATION OF ENGINEERING COMPANIES

BEVELED GEARS

Manufacturer has some available time for straight cut beveled gear work running from 1½" to 20", depending upon ratio, 4 pitch to 24 pitch. Equipped to handle coniflex or straight bevel tooth if required.

SIER-BATH GEAR & PUMP CO., INC.
9252 HUDSON BOULEVARD
NORTH BERGEN, NEW JERSEY

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them.
GENERAL PATTERN WORKS
2233 Bank Street Cincinnati, Ohio

Index of

PRODUCTS ADVERTISED

In This Issue

Abrasives, Coated 30-31, 32, 70-71, 182, 190, 201, 203, 310

Accessories & Attachments (Machine Tool) 28, 36, 224, 234, 237, 242, 256, 266, 270, 272, 304, 306

Arbors & Mandrels 303

Balancing Machines 56, 244, 262

Bearings ..... 4th Cover, 177, 204, 207, 215, 268

Bending Machines 305

Books, Technical 266

Boring, Drilling & Milling Machines (Horizontal) ..... 3rd Cover, 14-15, 19, 45, 46, 73, 84, 217

Boring Machines Internal ..... 2nd Cover

Boring & Turning Machines (Vertical) 14-15, 78, 217, 273

Broaching Machines 200, 260

Brushes 161

Cams 264, 277

Castings 202

Centering Machines 54-55

Centrifugal Machines 277

Chucks 36, 180, 234, 261, 276, 278

Collets 28, 234

Compressors, Air 229

Controls, Electrical 211

Coolant Systems, Filters & Supplies 136, 188, 269, 305

Cut-Off Machines; Sawing Machines 94, 214, 226, 270, 272, 280, 284

Drilling Machines 26-27, 54-55, 58, 77, 88, 92, 175, 187, 213, 219, 273, 280, 309, 311

Duplicators & Pantographs ..... 3rd Cover, 191, 205, 237

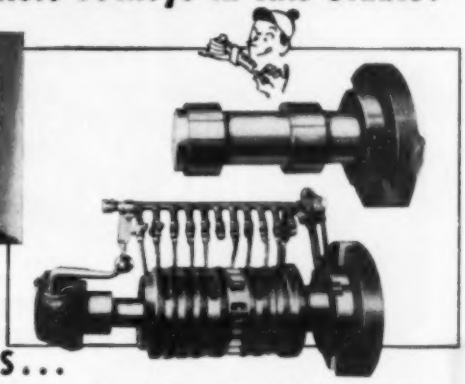
Electro Plating & Polishing Equipment & Supplies 30-31, 267

Engineering & Production Services 276

Exhibits 285

(Continued on page 304)

No Slide Rule Jockeys in this Stable!



ERICKSON FIELD ENGINEERS . . .

like L. M. "Bud" Lacey above—take pride in their background of really practical experience in getting the utmost in precision, speed and production out of the machine tools now in your plant.

A typical example of Bud Lacey's solution to a problem, through use of a precision holding tool, is the ERICKSON mandrel illustrated. It is designed to securely hold a cylinder for 11 simultaneous cuts while maintaining concentricity of ±.001". Use of this tool saves 99% of formerly required inspection time; rejects have been practically eliminated and production increased phenomenally.

Let an ERICKSON engineer demonstrate how your production rates can be stepped up through use of one or more of the famous ERICKSON Precision Holding Tools.

THINK OF THESE ERICKSON TOOLS IN TERMS OF YOUR PRODUCTION PROBLEMS:

- **COLLET CHUCKS** — prolong tool life, permit stubbing. GUARANTEED Accuracy of .0005" T.I.R. One Erickson Collet replaces 7 single purpose collets.
- **FLOATING HOLDERS** — correct both angular and parallel misalignment.
- **AIR CHUCKS** — compact, fast acting, tremendous gripping power.
- **EXPANDING MANDRELS** — Erickson principles applied to I.D. Holding.
- **SPEED INDEXERS** — operate by air or hydraulics, vertically or horizontally.

Write for Catalog "J" Today

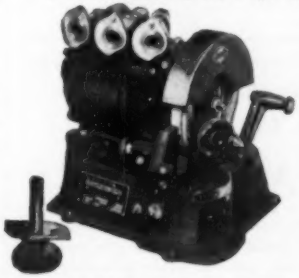
A-6683

ERICKSON TOOLS

DIVISION OF THE ERICKSON STEEL COMPANY

2302 W. HAMILTON AVE. • CLEVELAND 14, OHIO

SAVE—50% & more on Grinding Small Drills. SAVE on Drilling Time. SAVE by Reducing Work Spoilage. SAVE in Every Use of Small Drills.



This motor-driven machine cuts grinding and drilling costs 50% and more, saves expensive drill stock, reduces work spoilage and drill breakage.

Keep them sharp with a

BLACK DIAMOND

PRECISION DRILL GRINDER FOR ALL SMALL DRILLS

When you need sharp, small gauge or fractional drills in quantities—it costs real money to put an experienced mechanic to work on them.

With a Black Diamond, however, even the most inexperienced laborer can keep all small drills sharp, ready to meet any emergency—with lips accurately ground to exactly the same length, proper angle and with correct clearance for fast, precision drilling.

The built-in Diamond Point Dresser keeps the grinding wheel ever sharp cutting and the Web Thinning Attachment cares for all types of Notched points to perfection.

Write for More Complete Details Today

BLACK DIAMOND SAW & MACHINE WORKS, INC.

45 NORTH AVENUE, NATICK, MASSACHUSETTS

Eliminate Work Transfers! Cut Set-up Time In Half!

KNIGHT NO. 50 FOR VERTICAL MILLING & PRECISION BORING

More production—faster—with less labor and lower cost! This accurate, versatile and rugged solid-base No. 50 is now doing the work of 2 or more machines in hundreds of busy plants!

The No. 50 incorporates every essential feature for handling an extremely wide range of difficult boring and vertical milling jobs with production-line speed and toolroom precision. Time-wasting work transfers are completely eliminated—set-up time is reduced to half or less!

A powerful 7½ H.P. all-gear motor provides power to spare for the toughest jobs. Convenient quick-action controls and full-vision work areas make operation easy and effortless.

- Table feeds, 5 .16" to 20" per minute plus rapid traverse in all directions
- 16 spindle speeds, 40 to 2000 r.p.m.
- Boring feeds, infinitely variable, from .005" to .010"

ATTACH TO COMPANY LETTERHEAD

W. B. KNIGHT MACHINERY CO.
3920 W. Pine Blvd., St. Louis 8, Mo.

Send details on No. 50 and other Knight milling machines.

NAME .....

TITLE .....

☐ Send information on Knight 20" and 42" Power-Feed Rotary Tables

Mail Coupon For Details

KNIGHT VERSATILE ACCURATE RIGID

W. B. KNIGHT MACHINERY CO.
3920 WEST PINE BOULEVARD • ST. LOUIS 8, MISSOURI

From the *American Machinist* Library of *Tips for Top Shop Men*

DON'T underestimate the effect of an unsound sales budget on production efficiency. Inaccurate forecasts mean fluctuating schedules, a changing work force, and low worker morale.

ARE you lugging materials to and from a machine for a minor operation that should be done where the material is? Check facing to length, centering, cut off, plain grinding. If volume is large, it may be cheaper to move the machine once and for all rather than moving the material continuously.

Index of PRODUCTS ADVERTISED In This Issue

(Continued from page 303)

Fabricating Methods & Services 224
Fasteners 138, 212, 222, 245, 248, 261, 284

Gages & Instruments 16, 33, 34-35, 36, 51, 135, 160, 169, 171, 250, 270, 277, 281, 307
Gear Cutting Machines 3, 6-7, 52-53, 69
Gears, Speed Reducers, Motor Reducers 239, 264
Gear Testers 3, 6-7, 264
Grinders—Cutter & Tool 12-13, 60, 72, 257, 274, 303, 312
Grinding Machines—Production 4-5, 12-13, 43, 50, 159, 160, 181, 257, 266, 282, 312
Grinding Wheels 32, 70-71, 182, 201

Heads: Drilling, Grinding & Tapping 77, 277, 309
Heat Treating Equipment & Supplies 18, 223, 254
Honing Machines 82, 179, 280
Hydraulic & Pneumatic Parts & Equipment 54-55, 57, 219, 238, 251, 252-253, 255, 259, 265, 268

Jig Borers 244, 277

Lapping Machines 4-5, 43, 232
Lathes, Automatic 54-55, 56, 68-69, 75
Lathes, Engine 29, 41, 47, 60, 62, 163, 218, 237, 283
Lathes, Turret 56, 59, 61, 68-69, 306
Lubricants, Cutting Fluids, Quenching Oils & Solvents 37, 66-67, 136, 140, 142, 173, 185

Machines, Super Finishing 56
Marking Machines & Tools & Supplies 268, 272, 280
Materials, Cutting & Forming 74, 186, 210, 220-221, 233, 236, 246, 263
Materials of Manufacture 74, 167, 177, 183, 195, 207, 220-221, 227, 228, 236, 240, 279

Index of PRODUCTS ADVERTISED In This Issue

Materials Handling Equipment 241, 278
Mechanical Parts & Equipment 242, 272, 304, 306
Millers, Die Sinkers, Profilers 8-9, 20-21, 60, 244, 281, 284

Planers 14-15, 19, 84
Power Transmission 17, 65, 209
Presses, Forging & Forming Equipment & Supplies 22-23, 38-39, 40, 138, 165, 224, 231, 238, 243, 254, 268, 270, 275, 277, 280, 308
Production, Inventory & Tool Control 206
Pumps, Circulating 251, 305

Riveting Machines 280
Rust Preventives 261

Saw Blades 268
Screwdriving Machines 224, 256
Screw Machines; Chucking Machines 3rd Cover, 42, 63, 64, 196
Shapers, Slotters, Keyseaters 60, 94, 205, 276, 278, 281
Special Machine Tools 235
Stampings 282
Steel Blue 242
Swaging Machines 192

Tapping Machines 26-27, 68-69, 187, 280, 311
Thread Cutting Machines 10-11, 249
Thread Rolling Machines & Tools 235
Tools, Cutting 24-25, 44, 48-49, 52-53, 76, 80, 86-87, 91, 184, 189, 193, 194, 198, 200, 230, 254, 258, 260, 270
Tools, Hand 197, 208, 216, 242
Tools, Measuring 33, 34-35, 36, 189, 278
Tools, Portable 225, 247

Used & Surplus Equipment 287, 302

Vises 36

Welding & Cutting, Brazing & Soldering Equipment & Supplies 271

"it's easy to bend"

a new practical 32 Page diacro BENDING MANUAL

by the originators of "Die-less Duplicating"

This instructive and authoritative booklet will quickly prove itself indispensable wherever bending is done or is needed. It brings you a veritable gold mine of tested, authentic bending methods applicable to any rotary type bender. The proper bending technique may frequently offer a new approach to an old problem by simplifying product design and cutting production costs.

The exact methods of producing various types of bends in a wide range of materials are illustrated, step by step, with over 90 diagrams and charts together with valuable tooling suggestions.

You'll want a copy . . . Mail your request today.

O'NEIL-IRWIN
311 8th Ave.
Lake City, Minn.

designed for TODAY and TOMORROW

RUTHMAN GUSHER COOLANT PUMPS

Pioneers in the development of a practical machine-tool coolant pump, Ruthman has consistently offered you a better pump for your machines.

Totally enclosed drip-proof motors . . . heavy-duty pre-lubricated ball-bearings . . . electronically balanced rotating assembly, are a few of the many innovations Ruthman has introduced over the years. For the best coolant pump specify Ruthman. Write for catalog today.

THE RUTHMAN MACHINERY CO.
1818 Reading Road, Cincinnati, Ohio

ARMSTRONG *Carbide* TOOL HOLDERS

For Higher Speeds, and Heavier Feeds

ARMSTRONG Carbide Tool Holders and ARMIDE (Carbide Tipped) Cutters come in cased sets for tool rooms and maintenance departments, and individually in all sizes for general machine shop and production turning. They permit not only the ready machining of sand-filled castings, the hardest and toughest steels as well as many heretofore "unmachinable" materials, but also make practical much heavier cuts and cutting speeds up to 600 f.p.m. on ordinary work. They also run from 10 to 100 times as long between regrinds.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 WEST ARMSTRONG AVE., CHICAGO 30, ILLINOIS

NEW YORK • SAN FRANCISCO

MORE PRODUCTION . . . Less Effort!

41" & 55"

DEUTSCHE NILES

SINGLE COLUMN

VERTICAL TURRET LATHE

September/October Delivery!

For dependability, safety and extremely simple operation, the DEUTSCHE NILES offers many advantages. Speeds and feeds are easily controlled. All levers, manual and rapid traverse settings are controlled from the operator's position. Idle time is reduced to a minimum. High speed steels and carbide tools can be used. It is possible to use the full power of the machine without overloading.

J. M. LEHMANN CO., INC. 55 New York Ave., Lyndhurst, N. J. TELEPHONE: RUTHERFORD 2-7890

INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Abrasive Products, Inc.	190
Acme Gear Co.	264
Acromark Co.	268
Air Reduction	271
Allegheny Ludlum Steel Corp.	246
Allen Mfg. Co.	245
Allied Products Corp. Richard Brothers Div.	138
Allis-Chalmers Mfg. Co.	65
Allison Co.	201
American Chemical Paint Co.	195
American Steel Foundries, King Machine Tool Division	78
American Tool Works	29
Ames Co., B.C.,	307
Anderson Oil Co., F.E.	142
Apex Machine & Tool Co.	256
Armour & Co. & Subsidiaries	203
Armstrong-Blum Mfg. Co.	280
Armstrong Bros. Tool Co.	306
Avey Drilling Machine Co.	88
Baird Machine Co.	165
Ball & Roller Bearing Co.	268
Barber-Colman Co.	52-53
Barrett Co., Leon J.	277
Bath Co. Inc., John	230
Bay State Abrasive Products Co.	30-31
Bay State Tap & Die Co.	198
Behr-Manning Corp.	310
Bellows Co.	265
Bethlehem Steel Co.	233
Bilgram Gear & Machine Co.	264
Black & Decker Mfg. Co.	225
Black Diamond Saw & Machine Works Inc.	303
Blair Tool & Machine Corp.	264
Blake Co., Edward	274
Blanchard Machine Co.	50
Bliss Co., E.W.	231
Bonney Forge & Tool Works	216
Brown & Sharpe Mfg. Co.	33, 34-35, 36
Bryant Chucking Grinder Co.	159, 160
Bryant Machinery & Engineering Co.	41
Buhr Machine Tool Co.	87
Bullard Co.	45, 46
Bunting Brass & Bronze Co.	207
Burg Tool Mfg. Co.	311
Cadillac Stamp Co.	272
Carboloy—Dept. of General Electric Co.	86-87
Carlyle Johnson Machine Co.	209
Carborundum Co.	70-71
Carrier Corp.	269

INDEX TO ADVERTISERS

	Page
Chase Brass & Copper Co., Inc.	279
Cincinnati Bickford Tool Co.	77
Cincinnati Gear Co.	264
Cincinnati Grinders Incorporated	4-5
Cincinnati Milling Products Div. Cincinnati Milling Machine Co.	37
Cincinnati Planer Co.	14-15
Cincinnati Shaper Co.	94
Cleveland Automatic Machine Co.	64
Cleveland Twist Drill Co.	258
Columbia-Geneva Steel Div.	220-221
Columbia Tool Steel Co.	210
Columbus Die Tool & Machine Co.	224
Cone Automatic Machine Co.	63
Consolidated Machine Tool Corp.	19
Continental Tool Works Div. Ex-Cell-O Corp.	80
Cosa Corporation	273
Crane Packing Co.	232
Crown Industrial Products Co. Rust Div.	261
Crucible Steel Co. of America	263
Curtis Pneumatic Machinery Co.	229
Davis & Thompson Co.	309
Davis Keyseater Co.	281
Dayton Rogers Mfg. Co.	282
Defiance Machine & Tool Co.	280
Delpark Industrial Filtration	136
Detroit Broach Co.	91
Detroit Power Screwdriver Co.	224
DeVlieg Machine Co.	217
Diversified Metal Products Co.	282
Dow Chemical Co.	183
Dykem Co.	242
Eastern Machine Screw Corp.	277
Eastman Kodak Co.	171
Eisler Engineering Co. Inc.	277
Elastic Stop Nut Corp.	212
Ellstrom Standard Div. Dearborn Gage Co.	169
Erickson Tools	303
Ex-Cell-O Corporation	80
Famco Machine Co.	308
Federal Press Co.	243
Fellows Gear Shaper Co.	6-7
Fosdick Machine Tool Co.	58
Gallmeyer & Livingston Co.	312
Gardner Machine Co.	32
Garrison Machine Works Inc.	180
Giddings & Lewis Machine Tool Co.	14-15
Gisholt Machine Co.	56
Gleason Works	3
Gorham Tool Co.	76
Gorton Machine Co., George	191
Goss & de Leeuw Machine Co.	196

(Continued on page 308)

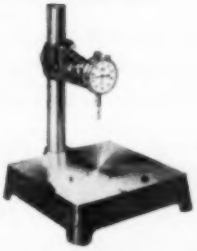
FOR *Strictly* IMPERSONAL INSPECTION CHOOSE AMES DIAL COMPARATORS

Ames Dial Comparators make the inspection of duplicate parts an extremely simple, rapid and accurate operation. Ames Comparators are strictly impersonal in their accuracy — the results being in no way dependent on the skill or judgment of the operator. The pressure of the gauging members against the work is mechanically determined and therefore uniform.

Check the Ames Dial Comparators shown — one of them may solve a Quality Control problem for you.

Ames No. 1 Dial Comparator is an easily adjustable bench model that measures objects up to 2" in cross section. The table bracket may be quickly located and locked in position on the column. The table itself may be further positioned and locked for final fine adjustment. This comparator is designated *Ames No. 1W* when equipped with dead-weight contact pressure and contact area to ASTM specifications for measuring resilient materials, such as rubber, plastics, etc.

Ames No. 2 Dial Comparator is a compact, stable bench model for measuring non-yielding materials — sheet metal, glass, hard rubber. The 2" diameter table is adjustable to bring pointer to zero. *Ames No. 2W* is similar to the Ames No. 2, but is furnished with dead-weight contact pressure and contact areas to ASTM specifications for checking textiles, plastics, sheet rubber, etc.



Ames No. 13 Dial Comparator features flat-ground, cast-iron base of ample size for using V-blocks and locating fixtures for checking rounds, flats and odd shapes. Also, the No. 13 can be fitted with a fine adjustment for close setting. Accurately adjustable bracket holds any Ames Micrometer Dial Indicator.

Ames No. 130 Dial Comparator is designed especially for inspecting comparatively large parts. For this reason, the flat-ground steel base, the adjustable indicator support on which can be mounted any Ames Micrometer Dial Indicator, and the upright column are proportioned to suit the user's particular requirements.

Send us your Quality Control job specifications, and we will supply complete details and proposal without obligation.

Representatives in principal cities

B. C. AMES CO.

26 Ames Street Waltham 54, Mass.

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

Just a Step From Racine

famco (COST CUTTING) **machines**

FAMCO MACHINE COMPANY

3136 SHERIDAN ROAD • KENOSHA, WISCONSIN

Famco proudly announces the purchase of new plant and office facilities at Kenosha, Wisconsin. Part of an expansion program undertaken by Famco, the new buildings — situated on twelve acres overlooking Lake Michigan — add substantial floor space to Famco's operation . . . with sufficient ground for further expansion as needed. It is requested that all future contact with the Company be made at the above address.

AIR PRESSES • ARBOR PRESSES • BAND SAWS
DRILL PRESSES • FOOT PRESSES • POWER PRESSES
POWER AND FOOT SQUARING SHEARS

From the *American Machinist* Library of *Tips for Top Shop Men*

"QUEER DUCKS"—the men that don't fit the pattern—are also the men who don't think like the rest. They'll give you trouble, but they'll usually also give you ideas. Barnyard ducks conform readily to rules, but end up in a pot.

WATCH always for the jobs you *can't* do—well. Specialized equipment and specialized knowledge outside may be worth the extra cost in reduced scrap and headaches. Sometimes the price may be less too—and it costs nothing to get an estimate.

INDEX TO ADVERTISERS

(Continued from page 307)

	Page
Grant Mfg. & Machine Co.	280
Gray Co., G.A.	84
Greaves Machine Tool Co.	284
Grob Brothers	270
Hannifin Corp.	252-253
Hanson-Van Winkle-Munning Inc.	267
Hardinge Brothers, Inc.	28
Hartford Special Machinery Co.	235
Haynes Stellite Co.	236
Heald Machine Co.	2nd Cover
Heller Brothers Co.	197
Henry & Wright Div. Emhart Mfg. Co.	22-23
Herman Stone Company	250
Hisey-Wolf Machine Co.	266
Hones, Inc., Charles A.	254
Hyatt Bearings Div., Gen. Motors Corp.	215
Industrial Filtration Co.	136
Ingersoll-Rand Co.	255
Johnson & Son Inc., S. C.,	185
Johnson Machine Co., Carlyle	209
Johnson Mfg. Corp.	214
Jones & Lamson Machine Co.	51, 59
Kalley Gear Works	264
Kearney & Trecker Corp.	20-21
Keller Tool Co.	219
Kempsmith Machine Co.	244
Kennametal Inc.	184
King Machine Tool Div., American Steel Foundries	78
Kling Bros. Engineering Works	226
Knight Machinery Co., W.B.	304
Kux Machine Co.	276
L-W Chuck Co.	276
Landis Machine Co.	10-11
Landis Tool Co.	12-13
LaPointe Machine Tool Co.	260
Lees-Bradner Co.	249
Lehmann Co., J. M.,	306
Leland-Gifford Co.	175
Lindberg Engineering Co.	223
Link-Belt Co.	17
Linley Brothers Co.	244
Lodge & Shipley Co.	47
Logansport Machine Co.	268
Lucas Machine Division, New Britain Machine Co.	73
Luers, J. Milton	268

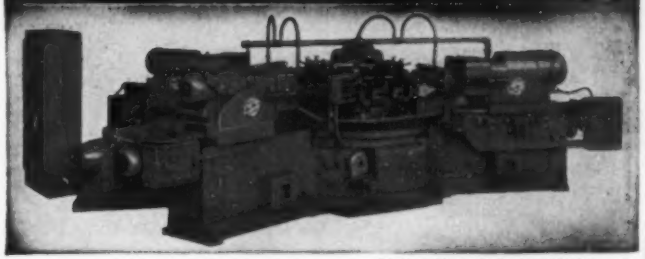
INDEX TO ADVERTISERS

	Page
M.B.I. Export & Import Ltd.	283
McCaskey Register Co.	206
McGill Mfg. Co.	204
McGraw-Hill Book Co. Inc.	266
Mead Specialties Co.	57
Meyers Co. Inc., W.F.	254
Micromatic Hone Corp.	82
Micro Switch Div.	211
Milford Rivet & Machine Co.	261
Mitts & Merrill	276
Moline Tool Co.	280
Monarch Machine Tool Co.	75
Morey Machinery Co. Inc.	64
Morris Machine Tool Co.	92
Morse Twist Drill & Machine Co.	24-25
Mueller Brass Co.	177
National Acme Co.	42
National Automatic Tool Co.	26-27
National Broach & Machine Co.	200
National Machine Tool Co.	278
National Malleable & Steel Castings Co.	202
National Tool Co.	189
National Twist Drill & Tool Co.	49
Nebel Machine Tool Co.	237
New Britain Gridley Machine Co.	3rd Cover
Niagara Machine & Tool Works	38-39
Nilson Machine Co., A. H.	254
North Bros. Mfg. Co.	242
Norton Company	43
Oliver Instrument Co.	72
O'Neil-Irwin Mfg. Co.	305
Orban Co. Inc., Kurt	60, 262
Osborn Mfg. Co.	161
Ottemiller Co., Wm. H.	284
Parker-Kalon Corp.	248
Philadelphia Gear Works	239
Potter & Johnston Co. Sub. Pratt & Whitney Div., Niles-Bement-Pond Co.	61
Precision Diamond Tool Co.	270
Racine Hydraulic & Machinery Inc.	272
Ready Tool Co.	272
Republic Steel Corp.	240
Revere Copper & Brass Inc.	167
Reynolds Metals Co.	227, 228
Rivett Lathe & Grinder Inc.	257
Rockford Machine Tool Co.	205
Rotor Tool Co.	247

(Continued on page 310)

Drilling and Reaming

388 KING PIN HOLES PER HOUR



Station Type Indexing Machine for drilling and reaming king pin holes.

On a Davis & Thompson 5 Station Machine

This type MDT FIVE STATION INDEXING DRILLER has five fixtures mounted on the index table. Each of these fixtures holds 2 RH and 2 LH automobile front suspension support arms. Four ROTO-MATIC Power Heads, each having four spindles, perform the following operations:

1. Drill 53/64" dia.—Half way through.
2. Drill .823" dia. — Balance of way through.
3. End Cut Ream .8547/.8550" — Full length of hole.
4. Finish Ream .8635/.8637"—Full length of hole.
5. Load and Unload.

Two RH and two LH pieces are completed at the end of each cycle. Cycling is automatic, and, operator loads and unloads during machine cycle.

4 New Davis & Thompson Mechanical Power Heads

Included in the design of this machine are the new ROTO-MATIC Mechanical Electrical Power Heads operated through screw feed. An important safety feature of these units is the patented overload release clutches on the feed. Because of the simplicity of their design the units require a minimum of servicing.

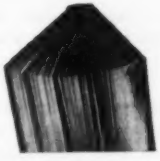
Free Data

Will be furnished on request.

DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company

6111 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN



STATISTICAL QUALITY CONTROL

By EUGENE L. GRANT

563 pages, 6x9, 50 tables, $5.50

FOR BETTER, CHEAPER CONTROL OF PRODUCT QUALITY . . .

—use the statistical quality control techniques explained in this book. Shows how to use the Shewhart control chart to reduce spoilage and rework . . . to get better coordination in design production and inspection.

McGRAW-HILL BOOK CO., INC.
330 W. 42nd St., New York 36

Send me Grant's Statistical Quality Control for 10 days' examination on approval. In 10 days I will remit $6.00, plus few cents for delivery or return book. (We pay for delivery if you remit with this coupon; same return privilege.)

Name _____
Address _____
City _____ Zone _____ State _____
Company _____
Position _____ FA-5-1-52

Offer applies to U.S. only.

NORTON® abrasives

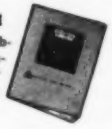
INDIA® and HARD ARKANSAS® OILSTONE FILES

Back of every profitable production job is the careful, hand-worked precision of die, jig fixture, or master part. A few strokes in the right spot with the correctly selected oilstone file may tell the tale of your product meeting full inspection approval instead of too large a volume scrapped.

Master tool and die makers depend heavily on NORTON Abrasive Oilstone Files, made of INDIA for the bulk of their stoning work, and of HARD ARKANSAS for the ultimate in finish. Available in all required shapes and grits. Also bench stones in a complete range of types and sizes.

FOR HANDY REFERENCE

get Catalog No. 19, describing and illustrating this entire line of Oilstones. Your request brings it. Address Dept. AM-8.



BEHR-MANNING

division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

Main Office and Plant: Troy, N. Y.
For Export:
Norton Behr-Manning Overseas Inc.

From the *American Machinist* Library of Tips for Top Shop Men

YOUR manufacturing engineers should have just one job: to make your present methods obsolete. The more they succeed, the greater is your productivity.

AN invisible boss presides over every collective bargaining session. He is not labor, management, or government—but is the customer, who exercises power of selection over your company's products.

TWO of management's most important words are "know" and "no." If you're strong on the first, you seldom hear the second.

INDEX TO ADVERTISERS

(Continued from page 309)

	Page
Ruthman Machinery Co.	305
Ryerson & Sons Inc., Joseph T.	186
Schnell Tool Die Co.	280
Schrader's Son, A.,	259
Scully-Jones & Co.	234
Second European Machine Tool Exhibition, Hanover	285
Sheffield Corp.	135
Sheldon Machine Co.	218
Shore Instrument & Mfg. Co. Inc.	277
Sibley Machine & Foundry Corp.	213
Sidney Machine Tool Co.	163
Simonds Abrasive Co.	182
Springfield Machine Tool Co.	41
Stahl Gear & Machine Co.	264
Standard Oil Co. (Indiana)	66-67
Standard Oil of California	173
Standard Pressed Steel Co.	222
Standard Tool Co.	44
Stone Machinery Co.	284
Sturtevant Co. P.A.	278
Sundstrand Machine Tool Co.	54-55
Sunnen Products Co.	179
Sun Oil Co.	140
Syntron Company	278
Taco Heaters, Inc.	188
Taylor Dynamoter & Machine Co.	244
Tennessee Coal & Iron Div.	220-221
Thompson Grinder Co.	181
Threadwell Tap & Die Corp.	193-194
Timken Roller Bearing Co.	4th Cover
Torrington Co.	192
Tubular Micrometer Co.	199
Union Carbide & Carbon Corp.	236
U. S. Burke Machine Tool Co.	281
United States Steel Co.	220-221
United States Steel Export Co.	220-221
United States Steel Supply Co.	74, 220-221
V & O Press Co. Div. Emhart Mfg. Co.	270
Van Keuren Co.	16
Van Norman Co.	8-9
Verson Allsteel Press Co.	275
Vickers Inc.	251
Walker Co. Inc., O.S.	278
Waltham Machine Works	277
Warner & Swasey Co.	68-69
Watson-Stillman Co.	238
Weldon Tool Co.	270
Wesson Co. & Affiliates	242
Westinghouse Electric Corp. Electronic & X-Ray Div.	18

INDEX TO ADVERTISERS

	Page
Whiton Machine Co.	261
Williams & Co. J.H.	208
Wilson Co. K.R.	40
Wilson Mechanical Instrument Co.	281
Winter Brothers Co.	48
Yale & Towne Manufacturing Co.	241
Zeh & Hahnemann Co.	268

SEARCHLIGHT SECTION
(Classified Advertising)
H. E. Hilty, Mgr.

EMPLOYMENT
- Positions Vacant 286
- Selling Opportunities Offered 286
- Positions Wanted 286
- Employment Agencies 286
- Employment Services 286

SPECIAL SERVICES
- Contract Work 302
- Associated Designers 302
- General Pattern Works 302
- Sier-Bath Gear & Pump Co., Inc. 302

EQUIPMENT
- (Used or Surplus New)
- For Sale 287-302

WANTED
- Equipment 286

ADVERTISERS INDEX

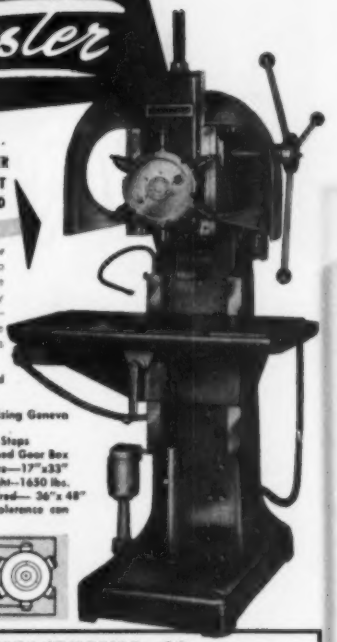
Aaron Machinery Co. 289
Amco Machinery Co. 300
American Can Co. 298
Beaver Industries 301
Bennett Machinery Co. 300
Boice-Crane Co. 302
Botwinik Bros. of Mass. 300
Brownell Machine Tools Inc. 296
Cadillac Employment Agency 286
Cowden Machinery Co., W. C. 300
Cox Machinery Co., Inc. 294
Currier Machine Sales 302
Di-Tru Tool & Manufacturing Co. 286
Donn Machinery Co., D. E. 296
Eastern Machinery Co. 290
Electric Equipment Co. 300
Falk Machinery Co. 287
Fairchild Engine Div. 286
Foster Machinery Sales Co. 300
Galbreath Machinery Co. 298
Goldman & Co., Harvey 292
Hill Clarke Machinery Co. 295
Hoy, L. J. 296
Hyman & Sons, Joseph 296
Indianapolis Machinery & Supply Co. 292
International Merit Products Corp. 293
Kaiser-Frazer Corp. 288
Kent Machinery Liquidators 290
Kings County Machinery Exchange 294
Linn-Shannon Machinery Co. 296
Lockheed Aircraft Corp. 286
MacDell Corporation 298
Machinery Rentals Inc. 299
Meyer, Machinery & Eqpt. Co., W. H. 302
Miles Machinery Co. 288
Morey Machinery Co. 291
Motch & Merryweather Machinery Co. 302
National Machinery Exchange 300
New Rochelle Tool Corp. 296
O'Connell Machinery Co. 288
Osborne & Seaton Machinery Co. 292
Paul's Machinery Co. 294
Sanderson-Cyclone Drill Co., The 298
Smith Machinery Sales Ed. 294
Surplus Machine Tool & Equipment 300
Triplex Machine Tool Corp. 297
West Penn Machinery Co. 296
Wigglesworth Industrial Corp. 298
Wigglesworth Co., T. R. 296
Williams, Edward Hale 300
Winston Machinery Co. 288, 298, 300, 302

SIX SPINDLE
PRE-SELECTIVE SPINDLE SPEEDS
TURRET TYPE AUTOMATIC INDEXING
DRILLING AND TAPPING MACHINE

. . . gives you 6 MACHINES IN ONE

THE NEW No. 2 MODEL A
Burgmaster

Designed for . . .
HIGHER PRODUCTION WITH GREATER ACCURACY AT LOWER COST PER PIECE MACHINED



The No. 2 Model A BURGMASTER will definitely cut your second operation costs because: Loss of time due to movements of parts from one spindle to another are eliminated; Close tolerances on size and concentricity are easily maintained; Set-up is simple and fast — unskilled operators can run the machine; Less floor space and power required; Rigidity, power and spindle speeds permit the use of high cutting speeds.

Now equipped with Warner electric clutch units in speed change mechanism.

- ★ ¼" Drill Capacity
- ★ ½" Tap Capacity
- ★ 1 to 2 H.P., 2 speed, 3 phase, 60 cycle Motor
- ★ 12 Spindle Speeds, ranging from 225-3000 R.P.M.
- ★ 4 Speeds, pre-selective per spindle, at any one setting
- ★ 8" Ram Feed
- ★ 19" Table Travel
- ★ Throat Depth—11-5/16"
- ★ Spindles Mounted on Class "O" Timken Bearings
- ★ Power Index, utilizing Geneva Mechanism
- ★ Individual Depth Stops
- ★ Completely Enclosed Gear Box
- ★ Table work surface—17"x33"
- ★ Approximate weight—1650 lbs.
- ★ Floor space required— 36"x 48"
- ★ Extremely close tolerance can be held

Write today for detailed information.

BURG TOOL MANUFACTURING CO. DEPT. AM-8
3743 DURANGO AVENUE • LOS ANGELES 34, CALIFORNIA

HERE'S Tool-flex
NEOPRENE MOUNTED FLOATING TOOL HOLDERS
Another Outstanding Product of
BURG TOOL MANUFACTURING CO.

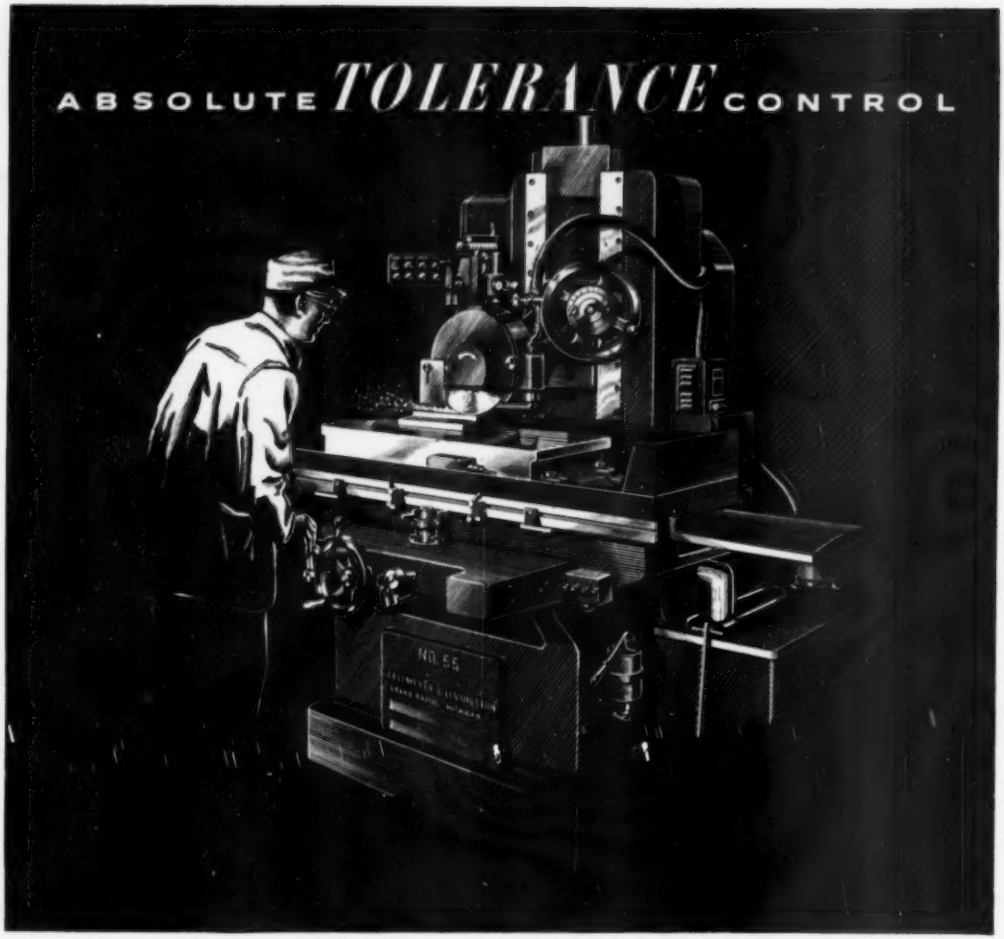
SELF-CENTERING
(ELIMINATES COSTLY SET-UP)
FULL-FLOATING • POSITIVE DRIVE
OIL-RESISTANT NEOPRENE MOUNTING
REDUCES TOOL BREAKAGE
SIMPLE CONSTRUCTION
(ONLY FOUR MAIN PARTS)

Tool-flex Made in any style shank or collet

Write for information . . . Dealer inquiries invited

BURG TOOL MANUFACTURING CO. Dept. AM-8
3743 DURANGO AVE. • LOS ANGELES 34, CALIF.

ABSOLUTE *TOLERANCE* CONTROL



When job specifications leave no leeway, when extreme tolerances must be maintained . . . that's when the built-in precision and absolute tolerance control of Grand Rapids Grinders proves most valuable. Defense commitments make it impossible for us to fill your orders as rapidly as we'd like to . . . but we know our customers can appreciate the reasons for delay. As always, we're doing our best to serve you.

GALLMEYER & LIVINGSTON CO.
330 Straight Ave., Grand Rapids, Mich.

GALLMEYER & LIVINGSTON

GRAND RAPIDS GRINDERS

. . . the very best

Manufacturers of
SURFACE GRINDERS • CUTTER and TOOL GRINDERS • TAP and DRILL GRINDERS

Invest in better methods for guaranteed returns
Automatic Bar and Chucking Machines • Precision Boring Machines
Lucas Horizontal Boring, Drilling and Milling Machines
New Britain +GF+ Copying Lathes
THE NEW BRITAIN MACHINE COMPANY
NB
NEW BRITAIN
Automatics
THE NEW BRITAIN GRIDLEY MACHINE DIVISION
THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT

8-speed Atlas miller gets greater spindle accuracy with TIMKEN® bearings

THIS Atlas MFC milling machine has 8 speeds, from 62 to 2870 RPM. It handles the full range of milling, from slabbing and facing cuts to end milling, keyways, finishing and layout work. And no matter what the speed or job, its spindle is held in accurate alignment by Timken® precision bearings. Precision milling is assured.

Due to their tapered construction, Timken bearings carry both radial and thrust loads in any combination. They can be adjusted to any desired preload to prevent chatter and provide maximum rigidity.

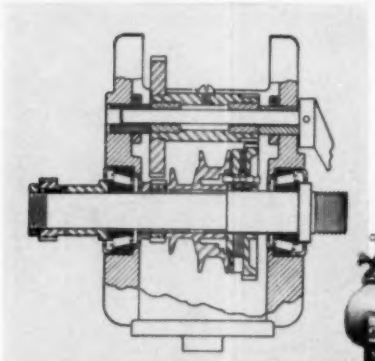
Timken precision bearings are made specifically for precision spindle applications. Timken "Double Zero" bearings are available with a maximum run-out of only 75 millionths of an inch (.000075″).

Because of their line contact between rollers and races, Timken bearings provide more than enough capacity for any tool load. And because of their true rolling motion and incredibly smooth surface finish, friction is practically eliminated.

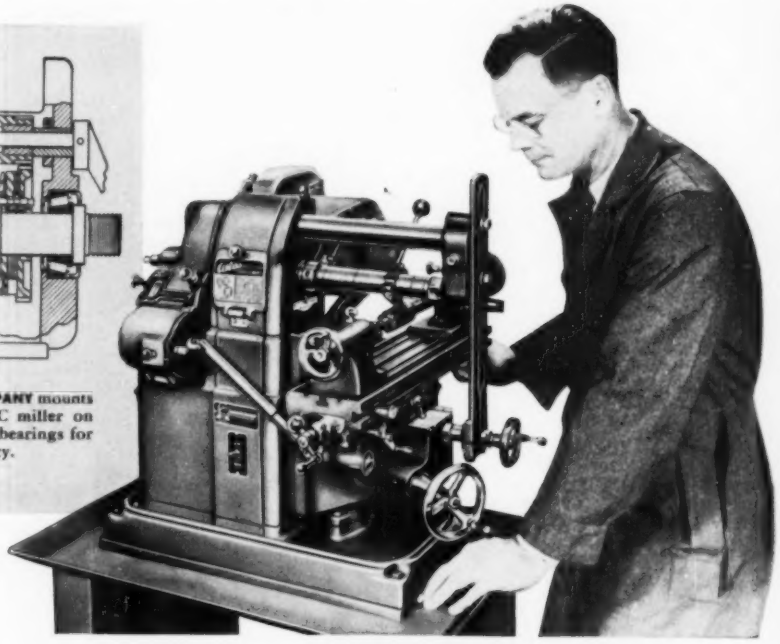
Timken bearings reduce machine tool manufacturing costs too. No special thrust bearings are needed. Assembly and set-up of the bearings are quick and simple.

Get all the advantages only Timken bearings offer you by specifying them for the machine tools you build or buy. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **ATLAS PRESS COMPANY** mounts the spindle of its MFC miller on Timken tapered roller bearings for greater spindle accuracy.



TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

FINISHED TO CLOSER TOLERANCES

Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at the Timken Company.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ⊂⊃ THE TIMKEN TAPERED ROLLER ⊂⊃ BEARING TAKES RADIAL ◁▷ AND THRUST →◁▷← LOADS OR ANY COMBINATION